OS/2 Warp Version 4 Certification Handbook

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INTERNATIONAL BUSINESS MACHINES CORPORATION

Dated: October 30, 2013

OS/2 Warp 4
Certification Handbook

IBM

Prepare for OS/2 Engineer Certification

SG24-4869-00

International Technical Support Organization

OS/2 Warp Version 4 Certification Handbook

October 1996

Take Note!

Before using this information and the product it supports, be sure to read the general information in Appendix H, "Special Notices" on page 1109.

First Edition (October 1996)

This edition applies to OS/2 Warp 4.

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Abstract

This book is designed as a self-study tutorial that covers the basic knowledge and skills required to become an IBM-certified OS/2 Warp 4 system engineer. The book covers the basic operating system functions and connectivity capabilities of OS/2 Warp 4 as well as such advanced features as:

- Multimedia
- The VoiceType function
- How to run DOS/Windows applications
- Backup and recovery function
- Available help functions and support features

Several practical examples are presented to demonstrate the ease of use of OS/2 Warp 4.

This book was written for computer professionals who are seeking OS/2 Warp 4 certification.

Some knowledge of personal computer hardware and software is assumed.

How This Book Is Organized

This book contains 1143 pages. It is organized as follows:

- Chapter 1, "Introduction to OS/2 Warp 4"

  This chapter provides a detailed, introduction and overview of the functionality and capability of OS/2 Warp 4.

- Part 1, "Fundamentals"

  Part one of the book provides a fundamental overview on OS/2 Warp 4. It covers the installation process, the usage and configuration of the OS/2 Warp 4 desktop, and it explains how to print files and documents.

- Chapter 2, "Planning and Installing OS/2 Warp 4"

  This chapter explains the installation process for:

  - The basic OS/2 Warp 4 operating system,
  - Connectivity and VoiceType applications
  - Documentation, additional available programs like Java, REX, productivity tools, games, etc.

- Chapter 3, "OS/2 Warp 4 Desktop"

  This chapter explains the OS/2 Warp 4 desktop configuration and usage.

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- Chapter 4, "Printing"

  This chapter provides information on how to print files and document with OS/2 Warp 4.

- Part 2, "Connectivity"

  This part of the book concentrates on the OS/2 Warp 4 connectivity functions of OS/2 Warp 4.

- Chapter 5, "Network Capability of OS/2 Warp 4"

  This chapter provides information on connectivity. It covers the remote LAN capability as well as TCP/IP support provided with OS/2 Warp 4.

- Part 3, "Advanced Concepts and Support"

  This part of the book concentrates on more advanced concepts and support functions such as:

  - Multimedia and VoiceType
  - How to run DOS and Windows applications
  - Backup and recovery procedures

- Chapter 6, "Multimedia Applications and Utilities"

  This chapter provides details on the multimedia functions provided with OS/2 Warp 4.

- Chapter 7, "The VoiceType Dictation Function"

  This chapter explains the VoiceType (speech recognition) function provided with OS/2 Warp 4

- Chapter 8, "How to Run DOS Applications"

  This chapter explains how to run DOS applications on OS/2 Warp 4.

- Chapter 9, "How to Run Windows Applications"

  This chapter explains how to run Windows applications on OS/2 Warp 4.

- Chapter 10, "Recovery"

  This chapter provides details on system recovery functions available with OS/2 Warp 4.

- Chapter 11, "Help Functions and Support Tools"

  Explains the help functions and support tools provided with OS/2 Warp 4 to troubleshoot your operating system environment.

- Chapter 12, "Additional Applications and Utilities"

  This chapter provides details on additional applications and utilities that come with OS/2 Warp 4.

- Appendix A, "OS/2 Warp 4 Hardware Requirements"

This appendix provides details on the hardware requirements to run OS/2 Warp 4.

- Appendix B, "OS/2 Warp 4 Directory and File Structure"

  This appendix provides details on the file and directory structure of OS/2 Warp 4.

- Appendix C, "OS/2 Device Driver Pak CD"

  Provides details on OS/2 Warp 4 device drivers.

- Appendix D, "Win-OS/2 Audio Drivers"

  Provides details on Win-OS/2 device drivers.

- Appendix E, "DOS and WIN-OS/2 Settings"

  This appendix provides details on the DOS/WIN OS/2 settings.

- Appendix F, "The OS/2 Warp 4 CONFIG.SYS"

  This appendix provides details on the OS/2 Warp 4 CONFIG.SYS, including an example and explanation for each line of the CONFIG.SYS.

- Appendix G, "OS/2 Warp 4 Certification Test Objectives and Study References"

  This appendix provides details on the OS/2 Warp 4 Certification test objectives.

The Team That Wrote This Book

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Chapter 1. Introduction to OS/2 Warp 4

OS/2 is an advanced operating system for PCs based on the Intel platform. This award-winning operating system was developed by IBM as the successor to DOS, the operating system developed for the original IBM PC. The first version of OS/2 1.x was developed for the 80286 processor. Beginning with Version 2.0, OS/2 has been a 32-bit operating system running on machines with at least an 80386 processor.

OS/2 started as a joint project between IBM and Microsoft in the mid-1980s and was first released in late 1987. Microsoft was a public and vocal supporter of OS/2 for years, issuing several of its own releases and promoting OS/2 application development. However, OS/2 versions from 1.3 onward have been the responsibility of IBM.

OS/2 was designed from the ground up with preemptive multitasking and multithreading in mind.

"Preemptive multitasking" means that the operating system is responsible for allocating processor time to the one or more applications that are running concurrently. Cooperative multitasking, as found in Microsoft Windows 3.x or the Macintosh's System 7, requires that each application surrender the processor after a certain amount of time. If one application refuses to yield, all the other applications stop running.

"Multithreading" means that programs can start subtasks that will then be executed by the operating system in the background. For example, a word processor may create a separate thread (subtask) to handle printing or saving to disk. When the user asks the word processor to perform one of these tasks, the word processor creates a new thread, and control returns to the word processor (and the user) immediately. The subtask is executed by the operating system in the background. The user is then free to ask the word processor to perform another task without waiting for the thread to complete. Applications that utilitize multithreading can be much more responsive to the user.

OS/2 also protects applications from one another. A single misbehaved program will not typically disrupt the entire system. OS/2 supports all addressable physical RAM and supplies virtual memory to applications as requested, breaking the DOS 640 KB barrier.

In the second half of 1994, IBM announced OS/2 Warp, the successor to the OS/2 Version 2.x generation. Let's have a quick look at some of the features that make OS/2 Warp the 32-bit operating system of choice.

1.1 OS/2 Warp

OS/2 Warp is designed for home users and business people on the go. It delivers the performance, stability and productivity of a 32-bit, multitasking environment. It enables users to run OS/2, DOS and DOS/Windows applications concurrently.

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Two versions are available: one uses your existing Windows software, and the other includes Windows application support. Both feature OS/2 and DOS application support. Combined with IBM's BonusPak, OS/2 Warp is a complete desktop and mobile solution providing a suite of productivity programs and online communication facilities, including an on-ramp to the Internet. Following is a list of OS/2 Warp's main features:

- Easy installation process
- Customizable desktop
- A tool bar that provides quick access to frequently used applications and functions
- Excellent visual cues, such as 3-D icons
- A tutorial that lets you practice tasks on the actual desktop
- Plug-and-Play capability for your laptop's PC Cards
- Hauppauge WIN/TV card support that can transform your PC into a TV
- Built-in Kodak Photo CD support (read-only) built in

A separate BonusPak for OS/2 shipped with OS/2 Warp at no extra charge. It includes the following applications:

- Easy access to the Internet
- IBM Works productivity applications: word processing, spreadsheet, charting, data filing and report writing
- Personal Information Manager
- CompuServe Information Manager for OS/2
- Person to Person for OS/2
- FaxWorks for OS/2
- Video IN for OS/2
- Multimedia Viewer
- HyperACCESS Lite for OS/2 modem communication software
- System Information Tool utility

1.2 OS/2 Warp Connect

OS/2 Warp Connect caters specifically to network users. It has all the advantages of OS/2 Warp, and it provides the additional programs you need for communication and resource-sharing with coworkers on a LAN. It provides the client support for IBM LAN Server, Novell NetWare and Microsoft servers. OS/2 Warp Connect includes IBM Peer for OS/2 so that, even without a dedicated server, you can share information, programs and devices (printers and modems) directly with coworkers. Mobile users anywhere in the world can link either to each other or to their office LAN with LAN Distance Remote. OS/2 Warp Connect also includes Lotus Notes Express, an express client to a Lotus Notes server.

OS/2 Warp Connect is also available in two versions: one that uses your existing Windows code and another that includes Windows. OS/2 Warp Connect has the same features as OS/2, including the BonusPak. Additional networking products and connectivity features are listed below:

- IBM Peer for OS/2, which lets you share resources with other PCs without needing a dedicated server
- A complete network client for LAN Server, NetWare and Microsoft servers
- Streamlined installation
- LAN Distance Remote for OS/2
- Lotus Notes Express
- TCP/IP for OS/2, which lets you cruise the Internet using either a dial-up or LAN connection
- TCP/IP protocols that let you send and receive E-mail, transfer files, and do remote printing
- Network SignON Coordinator, which lets you sign on to multiple network or host systems, change passwords and sign off from one or more locations, all in one simple operation
- AskPSP, an online help desk, that answers common questions about OS/2 Warp

1.3 OS/2 Warp 4

With its newest release of OS/2 Warp, IBM has raised the bar for integrated functionality in a desktop operating system solution. OS/2 Warp 4 is the premier network client, offering a complete and integrated solution for all users from the connected telecommuter to the large enterprise customer. While OS/2 Warp 4 provides access to the Internet and the office network, it also includes remote access for today's increasingly connected and mobile user.

OS/2 Warp 4 includes most of the features of OS/2 Warp and OS/2 Warp Connect, as well as a number of new and enhanced features. From a packaging point of view, it is important to note that there is only *one* version of OS/2 Warp 4. This means that in one box, you get all the OS/2 features and functions, the connectivity features, the BonusPak and the Windows code.

OS/2 Warp 4 is the 32-bit operating system solution that small and large corporations can count on to take full advantage of today's advanced Pentium and Pentium Pro systems. It is built upon a reliable foundation of proven code that has been running mission-critical applications for over ten years. The design emphasizes connectivity, providing easy access to the Internet, enterprise servers, midrange systems and mainframes.

1.3.1 What's New?

Among OS/2 Warp's most significant enhancements is the integration of IBM's latest VoiceType technology in speech navigation and dictation. OS/2 Warp 4 is the first major Intel-based operating system with built-in speech recognition, taking the concept of ease-of-use to an entirely new level.

It also is the first desktop operating system to integrate Sun Microsystems, Inc.'s Java programming language. In addition to its broad industry compatibility, it provides customers with unmatched connectivity features, improved systems management,

easier-than-ever Internet access and an improved user interface that shows off an enhanced version of the Lotus SmartCenter.

A device driver CD-ROM, OpenGL APIs and TrueType font support are among the additions that makes OS/2 Warp 4 compatible with emerging and established technology standards, thereby broadening the solutions available to customers and protecting their current technology investments.

1.3.2 Features and Benefits of OS/2 Warp 4 at a Glance

The following section provides an overview of the main features and benefits you gain by using OS/2 Warp 4.

1.3.2.1 Fundamentals

- **Ease-of-Use:**

  Use the WarpCenter and Connections folder to find information in a clear and consistent manner.
- **Devices:**

  OS/2 Warp supports more than 2,100 devices. A device driver CD-ROM is included in the package and by using a Web browser, you can view HTML documents right from the CD-ROM. Click on the links and go directly to the latest driver. Sometimes these links will take you to the manufacturer's home page. Plug-and-Play for ISA and support for PC Card devices are included, as is an easy-to-use Hardware Manager.

1.3.2.2 Connectivity

- **Lotus Notes Mail:**

  Use Notes Mail for fast and effective E-mail messages.
- **Networking and Communications:**

  Connects to popular client/server and peer file and printer sharing services. A 3270/5250 terminal emulation application keeps you connected with midrange and mainframe systems.
- **Internet capabilities:**

  The Internet-ready desktop enables drag-and-drop of Internet resources. Java for OS/2 provides native Java support in OS/2 Warp 4.
- **Mobile Features:**

  With Mobile File Synchronization, users can disconnect from the network, taking the shared files they need with them. When they reconnect to the network, any changes to either the server or client copy will be automatically detected. This ensures that users will be working with the most current version of their data. Users can choose to accept or reject the changes.
- **System Management:**

Remote functions, including TME 10 NetFinity, let the system administrator manage the workstation over a network. CID lets you install OS/2 Warp remotely.

1.3.2.3 Advanced Concepts and Support

- **Speech-enabled:**

  Speech Navigation and Dictation adds a new dimension to the way you interface with your computer.
- **Development Standards:**

  Java for OS/2 and OpenDoc for OS/2 supports development of platform-independent applications, while networking APIs keep them connected. The System Object Model (SOM) provides the foundation for developing applications in an object-oriented environment. Open32 allows easy recompilation of existing applications to the robust, 32-bit environment of OS/2. A graphics driver architecture, the Graphics Adapter Device Driver (GRADD), significantly reduces the amount of code and development efforts necessary to write graphics adapter drivers.
- **Compatibility:**

  OS/2 Warp 4 supports the largest base of applications, including OS/2, Windows 3.x (16-bit or Win32s Version 1.25a) and DOS. Additionally, screen and printer TrueType fonts are also supported.
- **Technical Support:**

  The Assistance Center provides comprehensive information and a set of tools to diagnose problems on the system. It includes AskPSP, a diagnostic expert system. Remote Support for OS/2 allows IBM technicians to dial into your system directly.

Let us now take a more detailed look at some of the fundamental, connectivity and advanced functional enhancements in OS/2 Warp 4.

1.4 Fundamentals

The next sections discusses fundamental functions of OS/2 Warp 4.

1.4.1 Ease of Use With an Enhanced Interface

OS/2 Warp 4 boasts more than just speech recognition. It also sports a cleaner and more logical user interface with visual such enhancements as three-dimensional shadowed icons, 256 colors, an array of customizable bitmaps and backgrounds, an attractive system font that reads well on laptop computers and customizable colored tabs in a newly designed settings folder.

IBM has merged the OS/2 LaunchPad and the Lotus SmartCenter, taking the best features from both to create the new OS/2 WarpCenter. The WarpCenter is an object-oriented icon ribbon on the desktop in OS/2 Warp 4 that will allow users to quickly and easily launch and group programs and check on the status of their systems. It includes a "Warp button" that dynamically creates a view of everything on the computer

desktop, a task list that indicates which programs are currently running, and status indicators for disk space and battery power, a calendar, clock and timer.

Users will be able to customize their WarpCenter simply by dragging and dropping icons onto it and then grouping those icons into trays. A tray could group any combination of objects: folders, applications or even icons representing World Wide Web pages.

With the WarpCenter visible at all times in any application, users can launch a new application, check the contents of a drive or even jump onto the World Wide Web without minimizing the space within which they are currently working. The WarpCenter can be deactivated if the user prefers.

1.4.2 Devices and Hardware Compatibility

OS/2 Warp 4 users have easy access to device drivers that support thousands of OS/2 devices through a CD-ROM that comes bundled with the product. Once installed, the CD-ROM immediately takes the user to a directory of OS/2 device drivers using a World Wide Web browser. This level of support provides the most current information about each driver, including how to install it. The directory tells users where to find the device drivers and provides a vehicle to obtain them. In some cases, users must hot link to a vendors' Internet home page to download the device driver. In other cases, they can download the driver directly from the CD-ROM.

This feature gives OS/2 Warp 4 users a single location to obtain information about virtually any driver they need. It provides users with a single point of contact when searching for drivers.

An enhanced resource manager in OS/2 Warp 4 eases the installation process for users and ensures that their hardware devices, such as printers and sound cards, have the resources they need in order to operate. For new Plug-and-Play devices, the resource manager detects the device, determines how much memory and other resources it needs, and then allocates the proper resources to it. In keeping with IBM's commitment to protect customers' investments, the resource manager also detects older devices supported in OS/2 Warp 4 and reserves the appropriate resources for them.

In addition, OS/2 increases the number of device drivers available. It supports a new graphics device driver architecture known as Graphics Adapter Device Driver (GRADD). GRADD gives hardware developers the basic foundation they need to create graphics device drivers, significantly reducing the amount of code they need to write and easing their development efforts.

1.5 Connectivity

The next sections discusses the connectivity functions of OS/2 Warp 4.

1.5.1 Lotus Notes Mail

OS/2 Warp 4 includes Lotus Notes Mail, the Notes Release 4 client/server messaging client, to provide OS/2 customers with a state-of-the-art E-mail solution. With Notes Mail and OS/2 Warp's new speech recognition software, sending and managing E-mail will be as easy as saying **"send"**, **"delete"** and **"reply"**.

With IBM's latest VoiceType technology and with Lotus Notes Mail, users can give vocal E-mail commands. A user can open a message quickly, dictate a reply and send it off without ever touching the keyboard.

Notes Mail brings a new level of functionality to users, wherever they use E-mail. With one click on the appropriate column header, they can sort messages by date, sender, and topic, and arrange folders in hierarchical order. Through Notes Mail, OS/2 Warp 4 also features type-ahead E-mail addressing, helps eliminate misdirected E-mail by automatically filling in a recipient's name based on the first few characters typed.

OS/2 Warp 4 extends Notes Mail with the inclusion of Post Office Protocol3 (POP3) and Multipurpose Internet Mail Extensions (MIME). POP3 support provides users with one program for all of their E-mail activities, including Internet mail and office messages. This allows users to receive all of their E-mail in one place, reducing the hassle of checking multiple locations for messages. With MIME, the standard Internet mail format, OS/2 Warp 4 users can send E-mail containing graphics, charts, scanned images, even video clips and sound bites.

OS/2 Warp 4 enables users to keep messages private. Users can click the "For Your Eyes Only" icon to restrict the ability of the recipient to forward a message. It turns off cut, copy, paste, printing and forwarding commands while allowing the recipient to reply only to the sender.

Since Notes Mail is a Notes Release 4 client, users can leverage the extensive facilities of the Notes Release 4 server to support scalable, reliable and secure client/server E-mail on the LAN or in a mobile environment.

An increasingly important need for computer users is to access E-mail on the road or from home. Notes Mail provides the user with superior mobile E-mail support in addition to its other strong connectivity features. With one click, users can specify their locations, communication methods and access codes, as well as different levels of access: full messages with embedded attachments, message headers only or the message header and the first few pages of a message.

A challenge for mobile users, who constantly switch from laptops to desktops, is to remember which computer holds which E-mail. Lotus Notes Mail and OS/2 Warp 4 solve this problem by providing a mailbox replication tool that automatically synchronizes between messages stored on the user's laptop and those on the local area network server.

Helping users to be more productive, Notes Mail provides a task management application that allows them to develop and manage "To Do" lists. Employees on the road, for instance, can assign tasks remotely to colleagues and track their progress. Integrated form filler and workflow capabilities let users route forms and documents to others for action.

1.5.2 Internet Access and Connectivity

OS/2 Warp 4 takes advantage of a built-in Web browser and object-oriented technology to make getting onto the Internet easier than before. Users can conveniently place icons representing their most frequently visited World Wide Web sites onto the computer desktop and then click on them to instantly launch an Internet home page. The URLs (Universal Resource Locators) represented by the icons can be loaded onto and off of diskettes and grouped into folders. This gives business users easy, fast access to information on the Web and home users hassle-free "Net surfing."

OS/2 Warp 4 allows simple and seamless interaction with a file transfer protocol (FTP) server through a new FTP folder that resides on the computer desktop. All users have to do to access an FTP server on the Internet is open the folder. They can then drag and drop files from their desktop to the server, and vice-versa. This eliminates the need to work from a command line or Web browser to connect to files on an FTP location.

OS/2 Warp 4 users also have access to a lot of applications once they are on the Internet. Under OS/2 Warp, it is easy for developers to port Windows Internet programs to the OS/2 platform. This is because the Winsock APIs used to build those applications are supported under the IBM Developer API Extensions built into OS/2 Warp 4. The Developer API Extensions are a subset of more than 700 APIs and 300 messages that are consistent with the most common Win32 APIs and messages.

With OS/2 Warp 4, IBM continues its commitment to provide open, multi-platform business solutions by establishing OS/2 Warp 4 as a universal client that will connect to any server operating system, in the same way that OS/2 Warp Server is a universal server that will connect to any client operating system. From PC server operating systems to mainframes, OS/2 Warp will be the connecting solution. In addition, OS/2 Warp 4 provides desktop access to all of the world's most popular PC server platforms, including:

- OS/2 Warp Server
- LAN Server
- Microsoft Windows NT
- Banyan VINES
- Novell Netware

Not only does OS/2 Warp 4 connect to NetWare servers, it also supports Novell's NetWare Directory Services (NDS) environment. This feature further establishes OS/2 Warp as an open solution, as it will allow OS/2 Warp users to globally and easily access all the resources found across an organization without having to know exactly which NetWare server contains the information.

OS/2 Warp 4 integrates IBM Personal Communications/3270 over TCP/IP, allowing communication between desktop users and mainframes. This emulation capability increases productivity for the user by allowing access to information stored on a host computer.

OS/2 Warp 4 users can quickly view and access all network resources available to them in a network window, where the resources are represented by icons. This function makes accessing and sharing as simple as dragging-and-dropping. For instance, a user can drag a Lotus 1-2-3 spreadsheet from a NetWare server and drop it onto a Warp Server machine.

In addition to being the universal network client, OS/2 Warp 4 can also act as a peer server with built-in peer capability that gives home users, departmental workgroups and small businesses an inexpensive, easy way to share such resources as files, printers and modems. OS/2 Warp 4 interoperates in a peer network with OS/2 LAN Server Version 3.0 or higher, Microsoft Windows for Workgroups, Microsoft Windows NT, Microsoft Windows 95, Microsoft LAN Manager 2.x, PC LAN Program 1.3 and Artisoft LANtastic 6.0.

OS/2 Warp 4 comes with a single requester to OS/2 Warp Server and other compatible networks, combining the previously separate LAN Requester and Peer Requester. With one requester, a user can share peer resources and administer the server through a GUI.

With OS/2 Warp 4, workers won't need to stay at the office in order to stay in touch with it. OS/2 Warp 4's built-in remote access capabilities and Mobile File Synchronization allow users to take their work on the road or to their homes without skipping a beat. These features are important for the travelling executive, parent, or anyone else who has to be away from the office - yet on the LAN - in order to get his or her work done.

The remote access capabilities give OS/2 Warp 4 users real-time access to network resources over a telephone line from home, a hotel room or a car as though they were still sitting in the office. In addition, with Mobile File Synch, they can disconnect from the network and know that their shared files will be updated when they log back on. Mobile File Synch detects any conflict between the client and server files and, if the user chooses, automatically duplicates to the server any tasks performed at the client and vice versa. This ensures that users will be working with the most current version of their data.

1.6 Advanced Concepts and Support

The next sections discusses the advanced concepts and support functions of OS/2 Warp 4.

1.6.1 Speech Navigation and Dictation

Built-in speech navigation and dictation capabilities allow OS/2 users simply to tell their computers what they normally would have to type or execute with a mouse. The navigation feature allows people to vocally navigate through menu bars and objects on the desktop in order to do things such as open files and launch applications, or pop onto the Internet hands-free with a simple phrase like "Jump to IBM Home Page." Working with a computer has never been so easy, and using a computer has never been so much fun.

The dictation component allows users to dictate memos and other documents and then paste them into word processing or E-mail applications. With this technology, doctors can review X-rays or examine patients and dictate their findings directly into a computer. Insurance agents can vocally process claims. Attorneys can create legal briefs while flipping through research materials. Business professionals can dictate electronic memos while simultaneously reading through hardcopy documents.

Based on IBM's latest VoiceType technology, speech recognition in OS/2 Warp 4 runs with any common OS/2-supported sound card including Sound Blaster compatibles, which come as a standard feature in most audio-enabled PCs. By integrating industry-leading VoiceType technology into the OS/2 base, IBM is offering customers an incredible value.

With years of IBM research behind it, the speech technology in OS/2 Warp 4 has advanced to a point where it is easy to use. OS/2 Warp 4 is speaker-independent, meaning the computer needs no training to understand what most users say. It even knows the difference between words with the same pronunciation yet different spellings, like to, too and two.

OS/2 Warp 4 also comes with a continuous navigator, allowing users to speak as they normally do - without inserting pauses between words - in order to navigate through the desktop and menus.

The navigation vocabulary in OS/2 Warp 4 includes common desktop navigation words. Dictation comes with a base vocabulary of 22,000 words and allows the addition of up to 42,000 more unique terms. Customers may also purchase separate vocabularies for such professions as healthcare and law. Furthermore, speech is supported in six languages:

- U.S. and UK English
- French
- Spanish
- German
- Italian

IBM is meeting with application developers to rally support for speech-enabled OS/2 applications. Currently, any OS/2 Presentation Manager (PM) object will automatically

work with the VoiceType navigator. PM objects include menu-bar headings, drop-down menus and buttons on the screen.

1.6.2 Java Support

In addition to incorporating a Java-enabled Web browser into OS/2 Warp, IBM integrates Java into the operating system, allowing it to natively run Java applications and Internet applets independent of a Web browser.

Java integration in OS/2 Warp benefits both software application developers and end users. OS/2 Warp 4 ships with a built-in Java Developers Kit, as well as the run-time code necessary for a Java application to run. Developers will not have to ship their own run-time with each application and end users will not have to make room for multiple run-times on their computers.

Java integration into OS/2 means that Java applications will run with the integrity, reliability and security of the operating system. Java integration also means that customers will be able to download Java applets, such as stock tickers from the Internet and place them onto their computer desktops or embed them into programs, such as spreadsheets or word processors. Furthermore, with OS/2 Warp 4's new Internet-aware user interface and built-in speech recognition, users can drag Java applets from a Web page onto the desktop and then launch them with a double click of the mouse or with a voice command. OS/2 Warp 4 is the only operating system that makes working with Java applets this easy.

Full, integrated Java capability is further proof that OS/2 Warp 4 is the best operating system for today's networked world. Java enhancements, combined with OS/2 Warp 4's Internet-aware user interface and its ability to connect to any server anywhere as a universal client operating system, establish OS/2 Warp 4 as the operating system that will connect users from wherever they are to whatever information they need, whenever they need it.

1.6.3 Software Compatibility

IBM has added several features to OS/2 Warp 4 that allow it to run leading-edge software designed for multiple operating system platforms. For instance, OS/2 Warp 4 supports the widely used OpenGL API. OpenGL is a high-quality, portable graphics API from Silicon Graphics Computer Systems that allows for development of complex three-dimensional applications in technical and commercial such areas as industrial design, computer-aided design, manufacturing, petroleum and chemical engineering, scientific visualization and entertainment. OpenGL support in OS/2 Warp 4 will allow applications built with this API to be developed on OS/2.

OS/2 Warp 4 comes with support for fonts that were built using the TrueType font specification. This means that when Windows 3.1 and Windows 95 users exchange documents with OS/2 users, the font used in the original Windows document will appear the same on the screen of the OS/2 user.

TrueType support in OS/2 Warp 4 allows OS/2 users to print to any printer without font substitution occurring at the printer. The printed document will retain the same typeface, style and color that the user sees on the screen.

In addition to OpenGL and TrueType support, OS/2 Warp 4 comes with OpenDoc run-time support, giving end users the ability to run next-generation, object-oriented component applications based on industry standards. OpenDoc is a robust architecture for creating component software that can be shared and customized across heterogeneous environments.

OS/2 Warp 4 integrates IBM's Developer API Extensions for OS/2 Warp, now known as Open32. Open32, introduced in May 1995, consists of more than 800 of the most commonly used Win32 APIs and the 300 most common Win32 messages. They enable software developers to write applications using common source code for OS/2 Warp and Win32 platforms, simplifying the port of existing Windows, Windows 95 and Windows NT applications to the OS/2 Warp environment. This way, developers can develop for both the OS/2 and Windows environment at once, rather than conducting a separate development effort for each environment.

With OpenDoc run-time support and Open32 built into OS/2 Warp 4 software developers that build applications using these techniques will gain a ready-installed base and open new business opportunities for their companies. To date, IBM has sold more than 14 million copies of OS/2 and is still the biggest software company in the world.

Part 1. Fundamentals

Introduction to OS/2 Warp 4 Fundamentals

OS/2 Warp 4 is the foundation for many sophisticated connectivity and usability functions. OS/2 Warp 4 is the only operating system on the market today with intrinsic support for speech recognition. Another feature provides an intelligent WarpGuide to assist users with common tasks. OS/2 Warp 4 also has many advanced connectivity features, such as peer networking capability, and networking requesters for all of today's popular network environments. This part discusses the fundamental tasks required to plan for and install OS/2 Warp 4, as well as the tasks necessary to customize and use it. It also covers the tasks needed to perform problem determination when trouble occurs.

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Chapter 2. Planning and Installing OS/2 Warp 4

Installation is one of the most important aspects of a successful operating environment. If you do the necessary planning before you install OS/2 Warp 4, chances are greatly improved that you will have a hassle-free operating environment. This chapter provides details on the necessary pre-installation planning and installation procedures for OS/2 Warp 4.

2.1 Pre-Installation Planning

You have the freedom to make some choices regarding how you set up your system to run OS/2 Warp 4 and your applications. There are several things that you need to determine before you install OS/2 Warp 4 and it is best to know what you want to do before you start. The following pages will discuss the alternatives that are available to you.

2.1.1 Memory and Disk Space Requirements

The installation of OS/2 Warp 4 on your computer requires at least 4 MB of memory. It is important to understand that 4 MB is only the *minimum* amount of memory required to run OS/2 Warp 4. If you intend to run multiple applications at the same time, or if you use large applications or data files, you will find that OS/2 Warp 4 performs noticeably better if you add more memory. OS/2 Warp 4 has a virtual memory facility that allows you to use more memory than you have physically installed in your computer. The memory that is required, in addition to what is physically installed, is stored on the hard disk in a file called *SWAPPER.DAT*. Remember, accessing information stored in the swapper file is slower than accessing information in real memory.

If you are installing remotely over a local area network (LAN), you will need an additional 2 MB of memory. The additional memory is necessary to run the LAN client code required for the installation, increasing the minimum memory requirement to 6 MB. If you intend to use communications software to connect to a LAN or the Internet, you will need to add more memory to ensure that your system performs adequately.

You will also need enough free space on your hard disk to install OS/2 Warp 4 and the options that you select. The amount of free disk space required depends on the hardware configuration of your computer and on the options that you select during installation.

2.1.2 Partitioning and Formatting Your Hard Disk

When you first purchased your computer, it is likely that the hard disk was set up as single logical drive (typically drive C). If you are installing OS/2 Warp 4 on a new computer, or if you do not mind backing up and restoring your applications and data, you might want to consider dividing your hard disk into multiple partitions.

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Even if you have only one hard disk in your computer, you can still divide it into a number of logical drives. For example, you might have a 500 MB hard disk, with a 200 MB partition allocated as drive C and the remaining 300 MB allocated as drive D.

2.1.2.1 Partitioning - Why?

Dividing your hard disk into multiple partitions and logical drives can make it easier to organize your programs and data. For example, you might load OS/2 Warp 4 onto drive C, your networking software onto drive D, and your applications and data files on drive E.

When you need to reformat any of your logical drives for whatever reason, you will only need to back up and restore the applications and data stored on that logical drive; the remaining drives will be unaffected. This makes it much easier to clean up your hard disk if necessary.

Another benefit of partitioning your hard disk is that you can run multiple operating systems using OS/2 Warp 4's Boot Manager feature. This feature allows you to select the operating system you want to run, from a menu displayed when you switch on or reboot your computer. Boot Manager is similar in concept to the Dual Boot feature, which allows you to switch between OS/2 Warp 4 and DOS/Windows, but more powerful since you can choose between up to four operating systems. See 2.1.2.6, "The Boot Manager" on page 22 for more information on Boot Manager and how to install it.

You should be aware that there is one disadvantage to partitioning your hard disk into multiple logical drives. At some point, you may find that you want to store a large file on your computer, and while you have enough free space on your hard disk, that space is spread amongst multiple drives, leaving you insufficient space on any one drive. You may then need to move files around between drives in order to create enough free space.

2.1.2.2 Logical Partitions - Primary and Extended

OS/2 Warp 4 supports two types of hard disk partition:

- **Primary partitions** are bootable partitions on which you can install any operating system, including OS/2 Warp 4, DOS, Windows and even UNIX. You can also store applications and data on a primary partition. Primary partitions may appear on the Boot Manager menu.

  You can create up to four primary partitions, but only one primary partition is visible to an operating system. For example, if you have two primary partitions, one loaded with OS/2 Warp 4 and the other with DOS/Windows, the DOS/Windows partition is invisible when you are running OS/2 Warp 4 and vice versa.

- **Extended logical partitions** can contain certain operating systems, such as OS/2 Warp 4, but not DOS or Windows. You can store applications and data on an extended logical partition. Extended logical partitions with operating systems can appear on the Boot Manager menu, and many extended logical partitions can be visible to an operating system.

For example, if you boot OS/2 Warp 4 from a primary partition and you have three extended logical partitions on your hard disk, the primary partition would appear as drive C and the extended logical partitions would appear as D, E and F. If you boot DOS/Windows from a second primary partition, that primary partition would appear as drive C, with the extended logical partitions again being D, E and F. The OS/2 Warp 4 primary partition would be hidden.

The advantage of using multiple primary partitions is that operating system files can be stored on the primary partitions, so they are hidden whenever you are using a different operating system. This means it is impossible to accidentally damage your OS/2 Warp 4 installation when running DOS or Windows, or to accidentally damage or erase files stored on your DOS or Windows partition when running OS/2 Warp 4. If you store your applications and data on extended logical partitions, these partitions will be accessible, with the same logical drive letter, from whichever operating system you run.

If you select the **Advanced** installation option you can set up the partitions for your hard disk during OS/2 Warp 4 installation. See 2.5, "Advanced Installation" on page 44.

If your hard disk is not partitioned prior to OS/2 Warp 4 installation, select the **Easy** installation option, which automatically creates a single partition the same size as your hard disk.

If you wish, you can partition your hard disk prior to OS/2 Warp 4 installation by following these simple steps:

1. Insert the OS/2 Warp 4 Installation Diskette and power on or reboot your computer.
2. Insert OS/2 Warp 4 Diskette 1 when prompted and press Enter.
3. When requested, insert OS/2 Warp 4 Diskette 2 and press Enter.
4. A Welcome! panel will be displayed congratulating you on your purchase of OS/2 Warp 4. At the bottom of this panel you will see a list of possible key strokes executable from this panel. Press the F3 key. The system will switch to a black panel, the OS/2 Command Interpreter with a [A:\] prompt.
5. Type `FDISK` at this prompt and press Enter. You will see the FDISK panel.
6. You can now use the FDISK program to partition your hard disk.
7. When you have completed partitioning your hard disk press F3 and select **Save**.
8. Reboot the system.

If you wish to change the partitions later, you can use the Fixed Disk utility (FDISKPM) provided with OS/2 Warp 4.

Note

Changing partition information on your hard disk will erase any programs and data files on the partitions that you change. Be very careful when using the Fixed Disk utility, and always back up your programs and data files before changing partition information.

2.1.2.3 FAT or HPFS?

OS/2 Warp 4 supports two types of file systems:

- The **File Allocation Table (FAT) file system** is the same file system used by DOS and Windows. If you install OS/2 Warp 4 over an existing DOS/Windows system, OS/2 Warp 4 will use the FAT file system to preserve your existing applications and data files. You can also use the FAT file system for a new OS/2 Warp 4 installation if you wish.

  The FAT file system provides slower disk access than the HPFS file system, but the difference is normally minor unless you are using very large disk partitions (greater than 250 MB) or data files. The advantage of using the FAT file system is that you can boot your system with DOS or Windows from the hard disk using either Boot Manager or Dual Boot.

  Alternatively you can boot from a DOS system diskette, and access any hard disk partitions that are formatted with the FAT file system.

- The **High Performance File System (HPFS)** is a different file system developed for OS/2. It provides fast disk access for large partitions and files, and is often used on server machines running OS/2 Warp Server.

  The disadvantage of using HPFS is that you cannot access an HPFS partition if you boot with DOS or Windows. Note, however, that DOS or Windows applications running under OS/2 Warp 4 can be stored on an HPFS partition and can access data files on HPFS partitions. OS/2 Warp 4 provides the disk access for such applications, and the file system is therefore transparent to the application.

  When OS/2 Warp 4 formats a diskette, it always uses the FAT file system, so you can easily exchange programs and data files between OS/2 Warp 4 and DOS/Windows systems. If you copy a file from an HPFS partition to a diskette, or from a diskette to an HPFS partition, OS/2 Warp 4 automatically converts the file format.

If you have multiple disk partitions, you can mix formats. For example, you might install OS/2 Warp 4 on an HPFS partition for greater access speed, but place your applications and data files on a FAT partition so that you can access them from DOS or Windows if necessary. Also see 2.10, "Tuning for Performance" on page 117 for performance implications.

You must choose the file system for your boot drive, that is, the drive on which you will install OS/2 Warp 4 during the OS/2 Warp 4 installation process. You can choose the file systems for other partitions later using the OS/2 Warp 4 FORMAT command.

2.1.2.4 How to Use FDISK and FDISKPM

Two versions of the Fixed Disk Utility program are provided: FDISK, a text version, and FDISKPM, a PM version. You can use either of the two for the same results. The Fixed Disk Utility Programs FDISK and FDISKPM enable you to partition your hard disks and specify Boot Manager support options.

The FDISK panel has five columns containing specific information about the partitions that exist on the hard disks in the system. Each hard disk is represented by a number at the top of the FDISK panel. When you select a hard disk, its partition information is displayed in the window. Partitions are either primary partitions or logical drives within an extended partition. Any free space (space within the hard disk that is available for more partitions) is also displayed in the window. This information includes:

- Name

  This is the name that has been assigned to any primary partition or logical drive on the Boot Manager Menu. This name is specified using the Add to Boot Manager Menu option and can be changed by using the Change Partition Name option.

- Status

  Indicates if a partition is installable, bootable, startable, or none of the above. If set to installable, the respective partition will be used as the target for continuing the OS/2 install. If set to bootable, the respective partition is displayed on the Boot Manager Menu when the system is restarted. If set to startable, the system restarts directly to this partition. This option is available for primary partitions only. Remember, one of the primary partitions must be set to startable for the system to restart successfully.

- Access

  Specifies if a partition is accessible. The letter in the column indicates that the partition is accessible. This column also indicates if the partition is a primary partition or a logical drive within the extended partition.

- FS Type

  Indicates the type of file system on the partition. Any partitions that have not been formatted will be displayed as unformatted. Any area on the hard disk not assigned to a partition will be displayed as free space.

- MBytes

  Indicates the size in megabytes of the partition or free space.

To modify a disk setup, select the partition or Free Space entry on the FDISK panel and then press Enter to display the Options pull-down menu.

From the Options menu you can select to:

- Install Boot Manager
- Create partition
- Add to Boot Manager Menu
- Change partition name
- Assign C: partition
- Set startup values
- Remove from Boot Manager Menu
- Delete partition
- Set installable
- Make startable

Make the selections for your disk, save the changes, and exit. You have to reboot your system for these changes to take effect.

Note

To obtain additional information regarding partitioning use the general help index in OS/2 Warp 4 and search on FDISK or FDISKPM. Further help is available within each of the utilities.

2.1.2.5 Partitioning - An Example

Figure 1 on page 21 shows a hard disk divided into multiple partitions with Boot Manager and two operating systems.

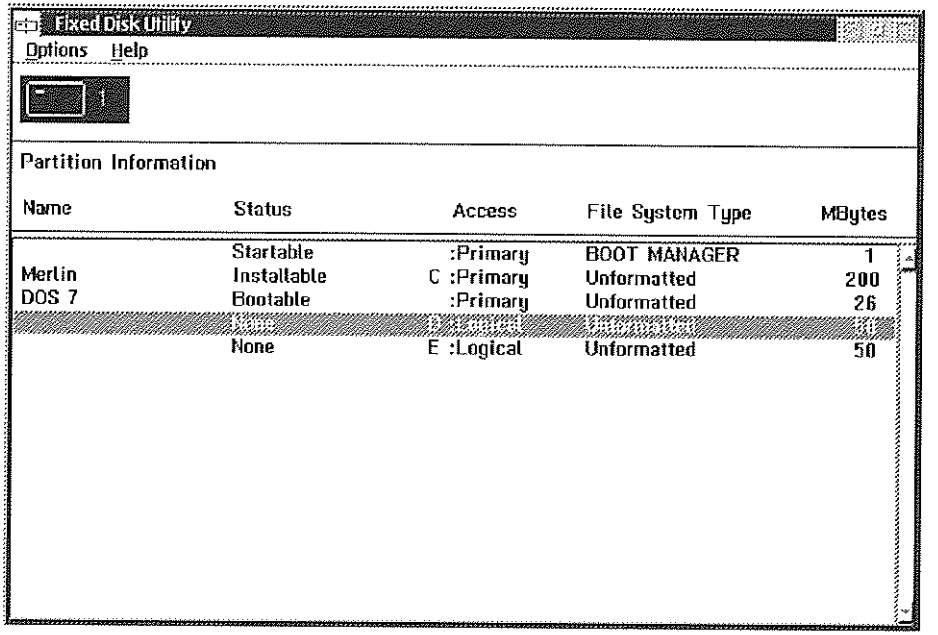

Figure 1. Hard Disk with Multiple Partitions

Boot Manager occupies the first 1 MB of the disk. See 2.1.2.6, "The Boot Manager" on page 22 for more information on Boot Manager. The remainder is taken up by two primary partitions and two extended logical partitions.

The first primary partition is 200 MB in size, and will be used to store the OS/2 Warp 4 operating system. Figure 1 shows the first primary partition labelled Merlin. This partition will be added to the Boot Manager Menu, making OS/2 Warp 4 a selectable operating system at startup time. When you create a partition solely for OS/2 Warp 4, we recommend that you use the HPFS file system.

The second primary partition is 26 MB in size, and will be used to store the DOS/Windows operating system code. This partition will be added to the Boot Manager Menu, so DOS and Windows will be selectable at startup time. This partition must be formatted using the FAT file system, since we will be installing a native DOS and Windows system on the partition.

The remaining 100 MB is split into two extended logical partitions, both 50 MB in size, and will be used to store applications and data files. These partitions will not appear in the Boot Manager Menu. We will format the one partition using the FAT file system and the other using the HPFS file system. The ramifications of this choice are:

1. When **Merlin** (OS/2 Warp 4) is selected from the Boot Manager at startup, the 50 MB FAT partition will be the D drive and the 50 MB HPFS formatted partition will be the E drive. OS/2 Warp 4 can use both the FAT and HPFS file systems simultaneously.
2. When **DOS 7** (DOS/Windows) is selected from the Boot Manager at startup, the 50 MB FAT partition will still be the D drive, but the 50 MB HPFS formatted partition will not be accessible because DOS/Windows can only access the FAT file system.

On the 50 MB HPFS partition, you may want to store code and data that you will only need to access when you boot OS/2 Warp 4. This will protect the code and data by making it "invisible" when you choose to boot DOS/Windows.

2.1.2.6 The Boot Manager

OS/2 Warp 4 provides a feature called Boot Manager. You can install it at the beginning of the OS/2 Warp 4 installation or after the installation has completed. Installation of Boot Manager after the OS/2 Warp 4 installation is permitted, provided that there is at least 1 MB of disk space that is not allocated to a partition. Disk space that is unallocated is known as free space. Boot Manager allows you to set up multiple operating systems on your computer. You select the one you want to use (boot) from a menu that is displayed every time you switch on or reboot your computer. You can use the FDISK or FDISKPM utilities to install Boot Manager.

Normally you would make the decision to install Boot Manager at installation time. See 2.3, "The Installation Process" on page 31. In this case, the installation procedure starts the FDISK utility, allowing you to partition your hard disk and install Boot Manager at the same time.

Boot Manager allows you to choose from up to four operating systems. This is done by using the Boot Manager Menu, an example of which is shown in Figure 2 on page 23.

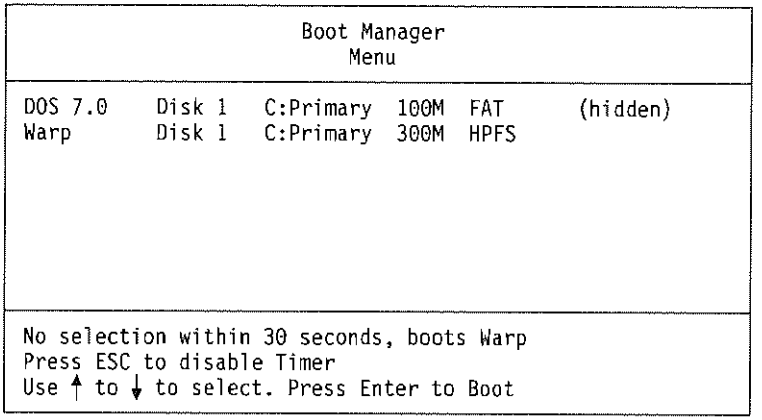

Figure 2. Boot Manager Menu

You can install Boot Manager prior to OS/2 Warp 4 installation or during OS/2 Warp 4 installation. You cannot install Boot Manager later without changing the partitioning of your hard disk, which will force you to reinstall OS/2 Warp 4, and possibly your applications and data files as well.

- To install Boot Manager prior to OS/2 Warp 4 you will need to boot from the three OS/2 Warp 4 Installation Diskettes and follow these steps:

  1. Boot from the *OS/2 Warp 4 Installation Diskette* and follow the prompts to change diskettes until you reach the Welcome! panel.
  2. At the bottom of this panel, you will see F3=Command Prompt. Press the F3 key and you will be switched to a black panel entitled OS/2 Command Interpreter Version 4.
  3. Type `FDISK` at the [A:\] prompt and press Enter. You will see the FDISK panel.
  4. Select **FreeSpace** and press Enter. You will see an Options menu on which one item is Install Boot Manager.

Problems?

If you cannot install Boot Manager using the above instructions, there is probably no free space (space on the hard disk that has not been partitioned) on the hard disk you have selected with FDISK.

Use the other FDISK options to delete partitions until you have free space available.

Note

When you delete a partition (even if you recreate it immediately) you lose all information on that partition. The changes you make in FDISK only become active if you select **Save** and then reboot the system.

- To install Boot Manager during OS/2 Warp 4 installation, select the **Advanced** installation option, and follow the steps described in 2.5, "Advanced Installation" on page 44.

After you install Boot Manager, the Boot Manager menu is displayed whenever you switch your computer on, or whenever you reboot your system. If you want to modify your Boot Manager menu after installation, or specify settings such as timeout values and default operating systems, you can use the Fixed Disk Utility.

Also, using the FDISK utilities you can change the startable partition. The startable partition is the partition that boots when you power your machine on or reboot it. That means you can select one of your primary partitions to be the startable partition and the Boot Manager will not appear any more. The Boot Manager partition must therefore be the startable partition if you want to use it.

2.2 Migrating to OS/2 Warp 4 From Other Operating Systems

Although you can install OS/2 Warp 4 on a computer that has no operating system installed, it is more likely that your computer already has some kind of operating system installed on it when you plan your migration. You will therefore be *upgrading* from the current operating system to OS/2 Warp 4. One of the most important things you have to consider before doing this is the currently installed operating system.

Always remember, migration is 70% planning and 30% activity. When you plan properly, you can complete the activities relatively easily.

2.2.1 Previous Versions of OS/2

Installation of OS/2 Warp 4 over previous releases of OS/2 and OS/2 Warp is quick and easy. You simply start the installation process, select the type of installation you want to do and the OS/2 Warp 4 installation process takes care of the rest. It will migrate your previous desktop settings as well as any networking and connectivity settings you may have.

You can install OS/2 Warp 4 over the following previous versions of OS/2:

- OS/2 Version 2.1x
- OS/2 Warp Version 3
- OS/2 Warp Connect Version 3

If you have one of the above operating systems installed, OS/2 Warp 4 will recognize your existing setup and migrate your system configuration files, desktop folders and icons.

Note

Note that OS/2 Warp 4 will *not* recognize and migrate your existing setup if you currently have OS/2 V2.0 installed. In this case, we recommend that you format your C drive before installing OS/2 Warp 4. The OS/2 Warp 4 installation may fail if you do not do so. Formatting can be done from advanced installation of OS/2 Warp 4.

2.2.2 DOS and DOS/Windows

DOS is the most commonly used PC operating system in the world. Many people run Windows, a DOS extension, as well. The OS/2 Warp 4 installation accommodates this and will preserve your current DOS/Windows setup if you so choose.

You can install OS/2 Warp 4 on a system that currently has DOS or Windows installed. Provided you do not format your hard disk during installation, OS/2 Warp 4 will not delete your existing DOS and Windows files. Instead, they will remain on your hard disk, and you can access your DOS/Windows system using the OS/2 Dual Boot feature.

You can install OS/2 Warp 4 over any version of DOS, and over the following versions of Windows:

- Windows 3.1x
- Windows for Workgroups 3.1x

Note

OS/2 Warp 4 will not install over an existing Microsoft Windows 95 system. If you have Windows 95 on your computer and you want to install OS/2 Warp 4, you should back up any existing data files and format your boot drive when you install OS/2 Warp 4.

2.2.2.1 Planning Your Migration from DOS/Windows 3.x

This section outlines the planning and activity steps that constitute a migration plan from DOS/Windows 3.x to OS/2 Warp 4. Although every business has a different LAN system, different client PC support structure, and different needs, the steps outlined apply to all business environments.

You may alter the sequence of the steps for your specific needs, but we recommend that you complete all the steps during your migration.

1. Select an OS/2 Warp 4 migration team

Assign the migration duties to a team of at least two individuals. The team should include a PC support coordinator, if you have one, and a user that wants to pilot OS/2 Warp 4. These two people will install and test OS/2 Warp 4. The PC coordinator will develop the OS/2 Warp 4 migration plan, develop the rollout process and do most of the installation. The user will assist the coordinator by testing your current set of business applications to ensure that they function properly in the OS/2 Warp 4 environment. If you don't have a PC coordinator, choose one of your most technically proficient users.

2. Educate the migration team

   This step is one of the most important, but often ignored, tasks in the migration. The more familiar a PC coordinator and user are with a new system, the more confident they become. The team will transfer the knowledge and experiences they gathered during testing to your other OS/2 Warp 4 users. The Assistance Center, which is part of OS/2 Warp 4, contains several tools that provide good, basic training.

3. Document the client PC environment

   When planning a migration, it is necessary to have a good understanding of the currently installed hardware and software. The client/server world is very fluid and flexible. This unstructured environment presents the greatest challenge to a smooth migration. Organizations with a strong control philosophy will find it easier to document their current PC hardware/software environment. Taking inventory of the wide range of PC adapters for peripheral devices and communications is one of the key tasks in this step.

   Although OS/2 Warp 4 will recognize and tailor itself based on its ability to recognize the hardware features, there are still some installation questions that may require specific hardware adapter knowledge. It is therefore necessary to have details on the current PC hardware, network connections and DOS/Windows 3.x applications readily available during the installation.

   - **Hardware Environment**

     OS/2 Warp 4 may require new device drivers for adapters and other peripheral devices that it will need to support.

     Minimum disk space and memory requirements may dictate changes to the current PC configurations. Your inventory should identify the following:

     - Processor Type (486, Pentium, or more advanced)
     - Amount of RAM installed
     - Available hard disk space and peripheral devices (printers, CD-ROM, scanners, etc.)
     - LAN Adapter card type and LAN address information
     - Disk compression software if any

     With Windows 3.x installed, you can use Microsoft Diagnostics (MSD.EXE) to display and print a great deal of information about each client. Run it from a

DOS prompt. DOS also has a QCONFIG command that lists details about the PC.

- **Software Environment**

  You need to document many individual client PC software definitions and settings for the migration. These include LAN addresses, WAN addresses, if applicable, as well as system settings and groupware definitions. Print copies of such files as CONFIG.SYS and AUTOEXEC.BAT for each PC. You can use this information to help with device settings and other configuration questions during OS/2 Warp 4 installation. During installation, OS/2 Warp 4 adds definitions to several Windows 3.x files. You should print and/or back up the following files for each client prior to installation:

WIN.INI	Windows master environment file
SYSTEM.INI	Windows device configuration file
CONTROL.INI	Windows control panel file
PROGMAN.INI	Windows program manager file
SETUP.INF	Windows setup file

- Verify PC hardware/software is OS/2 Warp 4 enabled.

  Based on the inventory step listed above, verify that the client PC has the minimum amount of memory, disk space, and processor capable of running OS/2 Warp 4. Use the recommendations outlined in 2.11.1, "Hardware Considerations" on page 131 as guidelines or get a tool from IBM called the *Just Add OS/2 Warp Upgrade Advisor*, which can be found on the Internet.

Verify the existence of the necessary device drivers for all of your adapters and peripheral devices. For testing, select a client PC or set of PCs that include features common to the majority of PCs installed in your organization. This ensures that the test installation of OS/2 Warp 4 covers the functions and features available to your users.

If your PCs are all very dissimilar, select a PC that has most of the hardware components and software that are available to your users. You may need to use several client PCs as test systems when there is a wide variety of configurations.

4. Back up all DOS/Windows 3.x software and data.

   Installation of a new PC operating system should be handled carefully. We recommend you back up all your current software, configuration files, and data files in case there is a need to restore them. The backup should include DOS/Windows 3.x and all application software that is currently used. If you have the original diskettes or CD-ROMs for your software, you won't need to make backup copies. Your organization may do backups regularly, if this is the case, just ensure that a backup has been completed recently and is available for any client PC used during the test.

5. Install OS/2 Warp 4 over the current DOS/Windows 3.x system.

Once you have verified that the PC hardware components will support OS/2 Warp 4 and you have done a complete backup of DOS/Windows 3.x and your business applications, then begin the test installation activity.

6. Test the DOS/Windows 3.x applications using OS/2 Warp 4.

   Testing can be as simple or as complex as you would like. You can use packages that utilize key stroke scripts to drive your applications or you can have the user on your team run their business applications on the test PC. Your level of testing depends on your environment and business needs.

   From your test process, determine any problems with your unique OS/2 Warp 4 setup. If any problems are encountered, do the following:

   - First attempt to fix the problem using the troubleshooting tips in the OS/2 Warp 4 documentation.
   - Use the Internet, Forums and Bulletin Board Services (BBS) sites available for questions.
   - If you cannot resolve a problem, use IBM service and support for OS/2 Warp 4.
   - For application problems, contact the appropriate vendor.
   - Correct any problems encountered and have your user retest the applications.

   Most applications will migrate easily and run as they did in your DOS/Windows 3.X environment. Once you have done a thorough user test of your applications, start the rollout process.

7. Select a software installation rollout process.

   The main consideration in selecting an installation process for your organizations is to determine how involved your users will be during the actual installation of OS/2 Warp 4 on their PC. You can choose techniques that range from no user involvement to complete installation by the user. All these techniques have been used successfully by other organizations. Usually, the best choice is to keep user involvement to a minimum.

   When a CD-ROM is not attached to each client PC, we recommend that you use the Remote Installation capability that is part of OS/2 Warp 4.

8. Develop the OS/2 Warp 4 rollout process.

   When your PC hardware environment is similar across all client systems, the rollout process for OS/2 Warp 4 is very simple. It only requires the distribution of OS/2 Warp 4, device drivers, and configuration files, whether it'll be across the LAN to the client PC, or from a CD-ROM attached directly to the client PC.

   If you are faced with a wide variety of PC types and attachments, you need to tailor the rollout process for each of the major configurations. From information gathered during the inventory, determine several configurations that match the majority of your client PCs. Test the rollout process for each major configuration. We suggest that you roll out only one configuration at a time.

9. Provide OS/2 Warp 4 training to users.

The OS/2 Warp 4 desktop has a slightly different look from your current DOS/Windows 3.x setup. Current users need training on the basics of OS/2 Warp 4. You need to demonstrate and then train users on the new terminology, use of the Warp Center, special key combinations, business application access, booting, and shutdown.

You should hold training as close as possible to the actual installation date of OS/2 Warp 4. Hands-on usage of a new system is your best teaching tool.

Most DOS/Windows 3.x users get conditioned to General Protection Faults. Their PC applications stop and they must reboot the system, but OS/2 Warp 4 can save them from having to reboot. They just need to restart DOS/Windows 3.x.

Also, to ensure file accuracy and to restore the Desktop the way it was at shutdown, OS/2 Warp 4 takes a little more time to boot and shutdown than DOS/Windows 3.x. Training should prepare your users for slightly longer boot and shutdown times and to only use Ctrl+Alt+Del or reboot as a last resort.

10. Rollout OS/2 Warp 4 to all client PCs.

    Once you have fully tested OS/2 Warp 4 with the current DOS/Windows 3.x applications, and the first set of users have had their training, it is time to implement. Use the Remote Installation Process to redirect OS/2 Warp 4 to the first wave of client PCs.

2.2.2.2 The CHKDSK Command

When you are planning to install OS/2 Warp 4 over an existing operating system it is always a good idea to first make sure that your hard disk is error free. You can use the CHKDSK command to do this.

CHKDSK analyzes directories and files, determines the file system type, and produces a disk status report. CHKDSK also displays the volume label and the volume serial number of the disk. CHKDSK can detect lost clusters on your disk. These are parts of files that the system did not save completely and that take up space on your disk. If CHKDSK finds these, it prompts you with a message asking if you want to convert lost chains to files.

The available CHKDSK parameters are:

- CHKDSK /F

  Fixes errors found on a disk or directory. When you use this parameter, no activity can occur on the disk. Therefore, the drive to be fixed cannot be the one from which you start the operating system, nor can it be the one that contains the CHKDSK program.

- CHKDSK /C

  Specifies that files will be recovered only if the file system was in an inconsistent state when the computer was started. A file system could be in an inconsistent state when files were left open. This can happen when the computer was turned off

before all files were closed or when electrical power to the computer was interrupted.

- CHKDSK /V

  Displays all files and their paths on the default or specified drive.

- CHKDSK /F:n

  Specifies a recovery level n. If no number is specified, CHKDSK assumes recovery level 2. The recovery levels are as follows:

  - /F:0

    Specifies that CHKDSK is to analyze the file system, display information about its state, but not perform any repairs.

  - /F:1

    Specifies that CHKDSK is to resolve inconsistent file system structures.

  - /F:2

    Specifies that CHKDSK is to resolve inconsistent file system structures and also scan disk space that is in use but not referred to by the file system. If recognizable file or directory structures are found, CHKDSK recovers them.

  - /F:3

    Includes all level 2 recovery and also specifies CHKDSK is to scan the entire disk partition for recognizable file system structures.

The CHKDSK command uses different parameters based on the type of file system you are using. The /C and /F:n parameters discussed above are only used with the High Performance File System. Before you install OS/2 Warp 4 over an existing operating system, run at least the following CHKDSK statements:

- FAT

  Boot your system using your current operating system or the OS/2 Warp 4 bootable diskettes and issue the command:

  ```
  CHKDSK C: /F
  ```

  where C: is the drive you want to install to.

- HPFS

  Boot your system using your previous version of OS/2 or the OS/2 Warp 4 boot diskettes. Issue the following CHKDSK command:

  ```
  CHKDSK C: /F:3
  ```

  where C: is the drive you want to install to.

2.3 The Installation Process

The installation process will transfer the necessary system files to the hard disk of your PC. You can perform the installation on a new PC or over a pre-existing operating environment including OS/2, Windows 3.x, or DOS. When installing over an existing partition, you have the option to migrate installed applications so that OS/2 Warp 4 will be aware of them.

When installing on a drive with Windows 95, you should take the steps to completely format the drive or install OS/2 Warp 4 on a separate partition. See 2.1.2, "Partitioning and Formatting Your Hard Disk" on page 15 for information on partitioning and formatting.

You can select an Easy or Advanced OS/2 Warp 4 installation procedure. Easy is the preferred choice if your client PC systems are not constrained by disk space. Advanced lets you select the individual OS/2 Warp 4 components during installation. This allows you to meet your requirements while minimizing the amount of disk space required for the operating system.

Read the IBM documents that are provided with OS/2 Warp 4. The following documents contain all the detailed information needed for installation:

- *Easy Start for OS/2 Warp 4*
- *Up and Running for OS/2 Warp 4*
- *User's Guide for OS/2 Warp 4*

Installing and configuring OS/2 Warp 4 is easy with its automatic hardware discovery, Plug and Play for ISA support, and an extensive Device Driver Pak. Once you have installed OS/2 Warp 4, you can easily modify your system setup by adding or removing hardware and software options.

Installing OS/2 Warp 4 is as simple as point-and-click. Throughout the process, it will provide you with clear instructions at each step along the way. Automatic software and hardware detection capabilities ensure that you spend only a minimal amount of time configuring and optimizing your system.

You can customize the installation, selecting only those options you wish to install. If your configuration needs change after installation, OS/2 Warp 4 lets you add or remove options as you see fit. The user-friendly configuration facility prompts you for additional information for newly installed components, and warns you if you are about to remove a feature that is currently being utilized.

Configuring hardware can be as easy as plugging in and turning on. OS/2 Warp 4 comes with drivers for many popular devices from a variety of vendors and includes the Device Driver Pak, which also has hot links to vendors' Internet sites for the latest drivers.

2.3.1 Media and Packaging

OS/2 Warp 4 is only available in one version. That means that in *one* pack you get all the features and functions of OS/2 Warp 4. This includes the BonusPak and all the connectivity features. OS/2 Warp 4 is only available on CD-ROM.

If your client PCs have CD-ROM devices attached, installation is very easy. If CD-ROM drives are not attached to the client PCs, several installation alternatives are available.

- You can create Installation Diskettes, but depending on the OS/2 Warp 4 components needed, this may require more than 40 diskettes.

  To create a set of Installation Diskettes, issue the MAKEDSKS command from a OS/2 Command line and follow the instructions.
- A LAN-based installation alternative called Remote Installation is available.

2.3.2 Things to Do First

- Prepare an IBM PC-compatible computer configured according to the recommended setup that best suits your situation.
- Ensure that the hard disk is either blank (no operating system) or contains an existing OS/2, Windows 3.x or DOS partition.
- Obtain three blank 3.5-inch high density diskettes.
- Configure a bootable disk that recognizes your CD-ROM drive (including any drivers that would be needed) or use a separate system running DOS or OS/2 that has a CD-ROM and 3.5-inch diskette drives.
- Create the Installation Diskettes.

To start the OS/2 Warp 4 installation, you must first create three diskettes for booting and installing the initial system files from the CD-ROM. Boot an operating system that can access the CD-ROM drive (or use another system that is already running) so you can make the diskettes.

Place the OS/2 Warp 4 CD-ROM in the CD-ROM drive. From a command line prompt, change directory to the CD-ROM drive. Run the CDINST program to start the diskette creation process. At various points in the installation, you will be asked to insert a new diskette into the drive. The CDINST program creates three diskettes: OS/2 Warp 4 Disk 1, OS/2 Warp 4 Disk 2, and the OS/2 Warp 4 Installation Diskette. Be sure to label each diskette accordingly.

2.3.3 Starting the Installation Process

OS/2 Warp 4 provides you with two installation options:

- Local Installation
- Remote Installation

The first method is to install OS/2 Warp 4 directly from the CD-ROM drive in your computer. Since OS/2 Warp 4 is only available on CD, you will require a CD-ROM drive to use this installation method.

2.3.3.1 Local Installation

On the machine where you will be installing OS/2 Warp 4, insert the Installation Diskette in the diskette drive and the IBM OS/2 Warp 4 CD-ROM in the CD-ROM drive.

Boot the system with the Installation Diskette in the diskette drive. After the Installation Diskette has loaded, you will be prompted to insert OS/2 Warp 4 Disk 1. Insert the disk and press Enter. After the disk has loaded, you will be prompted to insert OS/2 Warp 4 Disk 2. Insert the disk and press Enter.

After this process, a Welcome panel will appear, explaining the new features of OS/2 Warp 4. Press Enter to continue. On the Installing OS/2 Warp 4 panel, you get the opportunity to choose between the Easy or Advanced installation process.

Note

It is possible to install OS/2 Warp 4 locally on a machine without any CD-ROM drive. This is done by installing via diskettes. In order to do this you have to create the OS/2 Warp 4 installation diskettes. Depending on the options you want to install this can require as many as 100 diskettes. You will need access to a machine with a CD-ROM and Diskette drive to create the diskettes. You can use the MAKEDSKS.CMD or PRODDSKS.CMD commands for this.

2.3.3.2 Remote Installation

If you want to install OS/2 Warp 4 on a system without a CD-ROM drive you can use this method. This method is mostly used in a workgroup type of environment where you have a relatively small network of computers. At least one of these systems must have a CD-ROM drive attached.

Install OS/2 Warp 4 onto the machine with the CD-ROM drive using the instructions in the following section. Once OS/2 Warp 4 is up and running on the system with CD-ROM drive, you can use the Remote Installation procedure to install the other systems.

On the system with the CD-ROM drive on which OS/2 Warp 4 is installed:

1. Double-click on **OS/2 System**
2. Double-click on **System Setup**
3. Double-click on **Install/Remove**
4. Double-click on **OS/2 Warp Remote Install**

This will start the OS/2 Warp 4 remote installation program. Click on **Next** to continue. The following panel will instruct you that you need to create Installation Diskettes for the remote workstation. The next panel that will be displayed is the Select Network Adapter panel. See Figure 3 on page 34.

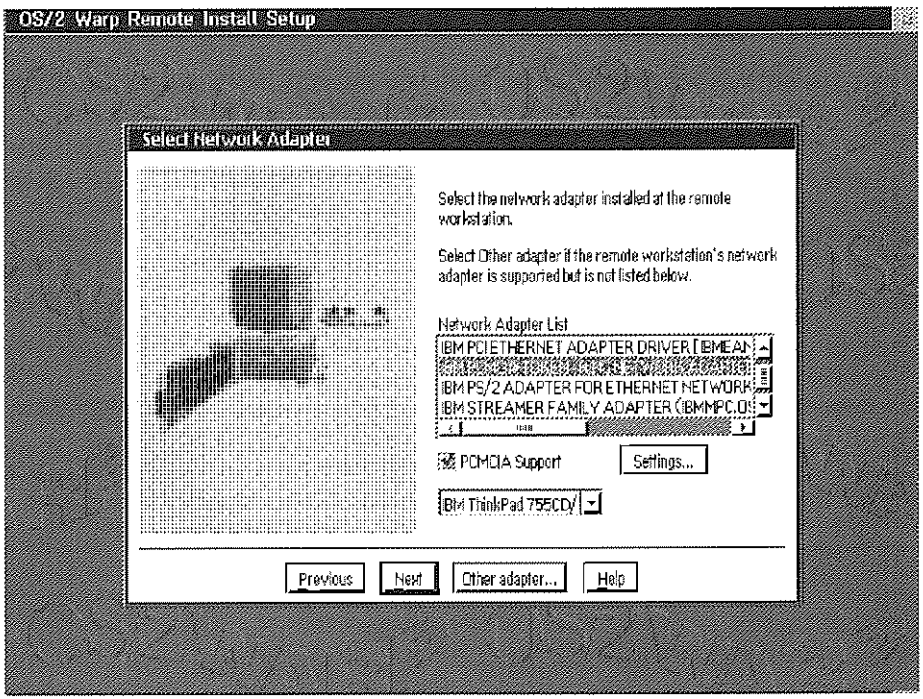

Figure 3. Select Network Adapter

It is important to know what type of network adapter card is installed in the remote workstation. Make your selection from this list. If your adapter card is not in the list but you do have a device driver for the adapter, click on **Other Adapter.** This will install the device driver for the specific adapter in the remote workstation.

If your remote workstation is a notebook computer using a PC-Card LAN adapter, make sure to select PCMCIA Support and to select the machine type. You can also make some adapter card settings such as the interrupt request for an IBM Token-Ring adapter. See Figure 4 on page 35.

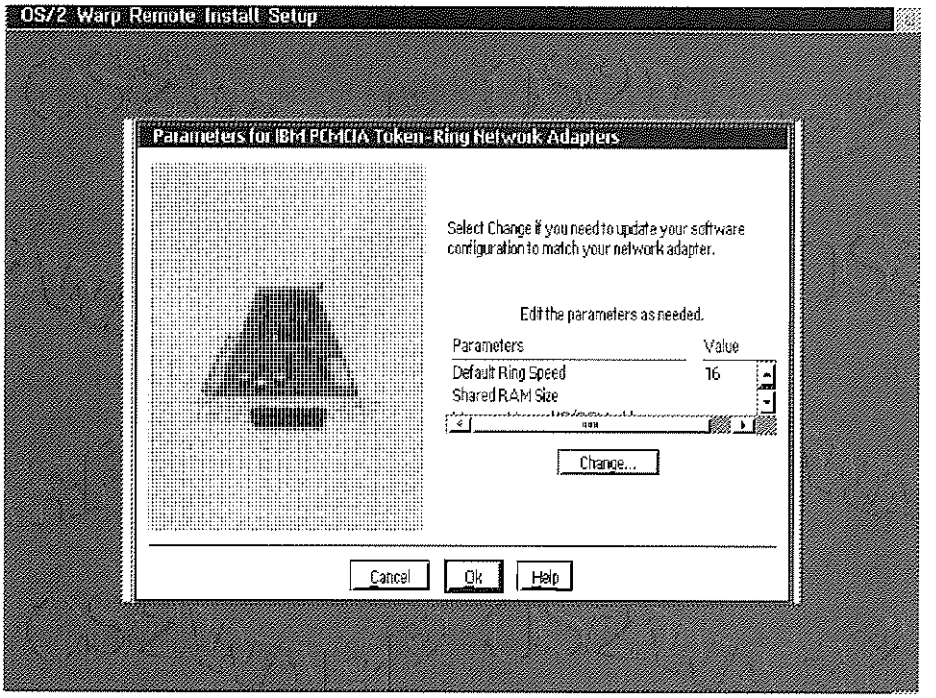

Figure 4. Parameters for Network Adapter

After you have made your selection the remote installation diskettes will be created. Three diskettes will be created: OS/2 Warp 4 Disk 1, Disk 2 and the Installation Diskette.

After the diskettes have been created the OS/2 Warp 4 system will start the installation server and wait for connections to be made from remote workstations. A status window will be displayed:

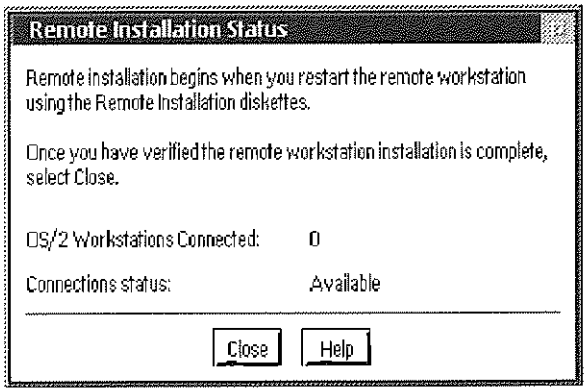

Figure 5. Remote Installation Status

If you have already created diskettes for a workstation you can use them again. Provided the workstations uses the same type of network adapter, you don't have to recreate the diskettes.

Take the diskettes to the remote workstation and boot with it. This will load a slimmed-down version of the OS/2 network drivers and make a connection to the remote installation server. From this point onwards, the installation behaves like a normal OS/2 Warp 4 local installation. Continue by making your selection between Easy or Advanced installation covered in the following sections. This type of installation is also commonly referred to as a redirected drive installation.

2.4 Easy Install

The Easy installation option is designed to be a simplified installation. The OS/2 Warp 4 Easy installation option procedure takes most of the necessary decisions for you and installs the following options:

- **OS/2 Warp 4 Base**
- **Assistance Center**
  - OS/2 Tutorial
  - OS/2 Warp 4 Command Reference
  - REXX Information
  - WarpGuide User Interface Agent
- **Fonts**
  - Courier
  - Helvetica

- System Mono-Spaced
- Times Roman
- Courier (outline)
- Helvetica (outline)
- Times Roman (outline)

- **Optional System Utilities**
  - Back Up Hard Disk
  - Change File Attributes
  - Display Directory Tree
  - Manage Partitions
  - Label Diskettes
  - Picture Viewer
  - PMREXX
  - Recover Files
  - Restore Backed-Up Files
  - Sort Filter
  - Create Utility Diskettes
  - Serviceability and Diagnostic Aids
- **Optional System Components**
  - VoiceType (dependent on appropriate hardware)
  - Dedicated DOS/Windows Session

    Available only if the C partition is on an IDE disk and is formatted FAT and/or both DOS and OS/2 are installed on the C partition.
  - High Performance File System
- **Tools and Games**
  - Enhanced Editor
  - Search and Scan Tool
  - Solitaire - Klondike
  - Pulse
  - Chess
  - Mahjongg Solitaire
- **OS/2 DOS Support**

  - Protect Mode Interface
  - Virtual Expanded Memory Management
  - Virtual Extended Memory Support
- **WIN-OS/2 Support**
  - Readme files
  - Accessories
  - Panel Savers
  - Sound
- **Multimedia Software Support**
  - Base Multimedia Support
  - Software Motion Video

The Easy installation process will also make the following decisions on your behalf:

- OS/2 Warp 4 will be installed on drive C.

  The Easy installation will always install on your default primary drive, normally C. It does not give you the option to change drives, partitions or partition sizes.

- If drive C is not already partitioned and formatted, the installation procedure will create a single partition, the size of your disk, and format it using the FAT file system. If drive C is already partitioned and formatted, then no additional hard disk partitioning or formatting will take place. If you would like to partition your hard disk and/or install Boot Manager prior to Easy installation, the instructions in 2.1.2, "Partitioning and Formatting Your Hard Disk" on page 15 and 2.1.2.6, "The Boot Manager" on page 22 are a guide on how to do this.

  Make Sure You Have a Large Enough C Drive

  - The C drive must be least 175 MB in size, or the Easy installation will fail.
  - If you only have one drive with 175 MB, this will leave you with approximately 7 MB free disk space after the installation. This assumes a 2 MB SWAPPER.DAT file. Most systems require a larger swapper file, (approximately 15-20MB) In this case you can either:
    - Partition a larger C drive or
    - Edit the CONFIG.SYS file and change the location of the SWAPPER.DAT file. To get information on doing this, type `HELP SWAPPATH` at an OS/2 command prompt.

- The Dual Boot feature will be installed if OS/2 Warp 4 detects an existing DOS or Windows installation.

- OS/2 Warp 4 will only install the VGA (Video Graphics Array) video driver which works on almost all video adapters. VGA only supports:
  - 640x480 panel resolution
  - 16 colors

  You can install the appropriate video driver after the installation is complete (see 2.6, "Selective Install" on page 55) or during the installation by selecting the **Primary Displ**ay icon on the System Configuration panel in Figure 11 on page 46. Also see Figure 13 on page 48.
- OS/2 Warp 4 will automatically detect and configure hardware device drivers for the following:
  - CD-ROM drive
  - SCSI adapter
  - Advanced Power Management (APM) if you have a laptop system
  - Printer (you will be asked to accept a default printer or to select a printer of your choice)

From the Installing OS/2 Warp 4 panel press the 1 key to select **Easy** and start the Easy installation process. The system files are now copied to your local disk. This is followed by the copying of disks 3 to 11. After diskette 11 has been copied, the Installation Diskette, Diskette 1 and finally Disk 2 are copied.

Some more system files are now copied as well as the OS/2 Warp Installation program. A final installation check is done before the system prompts you to remove the diskette from the drive and to press Enter to restart the workstation.

After rebooting, the system objects are created and the System Configuration program is loaded. During system configuration, OS/2 Warp 4 discovers the devices that are installed on your workstation.

The System Configuration panel appears after the core operating system is successfully copied to the hard drive. Figure 6 on page 40 shows all of the hardware that OS/2 Warp 4 has recognized and configured for you.

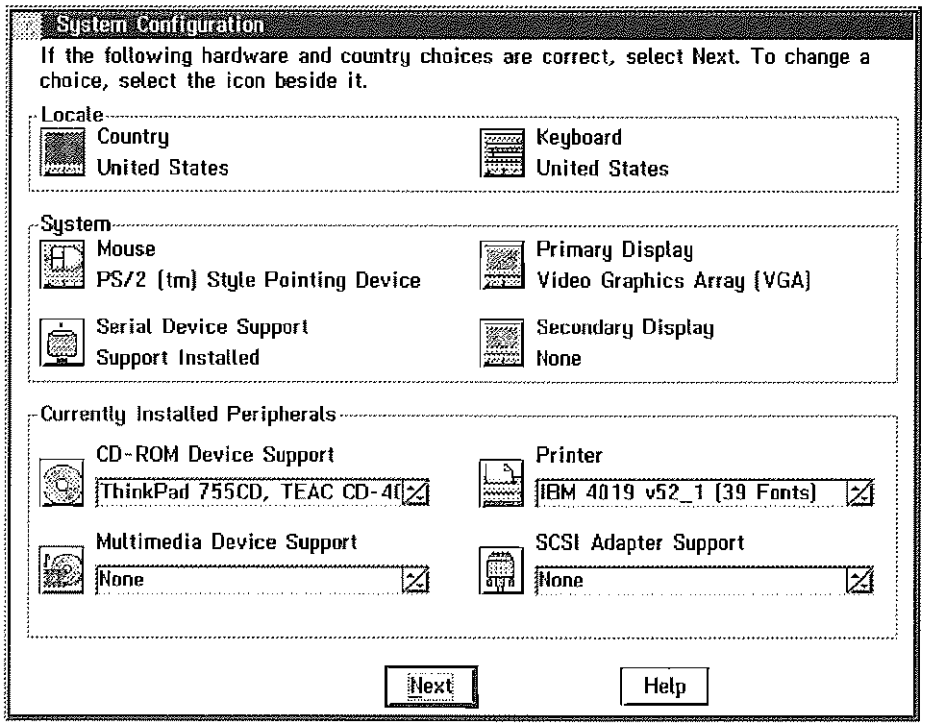

Figure 6. System Configuration

If any of the items are incorrect, then click on the icon next to the component and select the correct option from the list of available devices. Alternatively use device drivers supplied by the manufacturer. When all your selections are correct, click on **Next** to continue.

The Additional Hardware window now appears. This window is shown in Figure 7 on page 41.

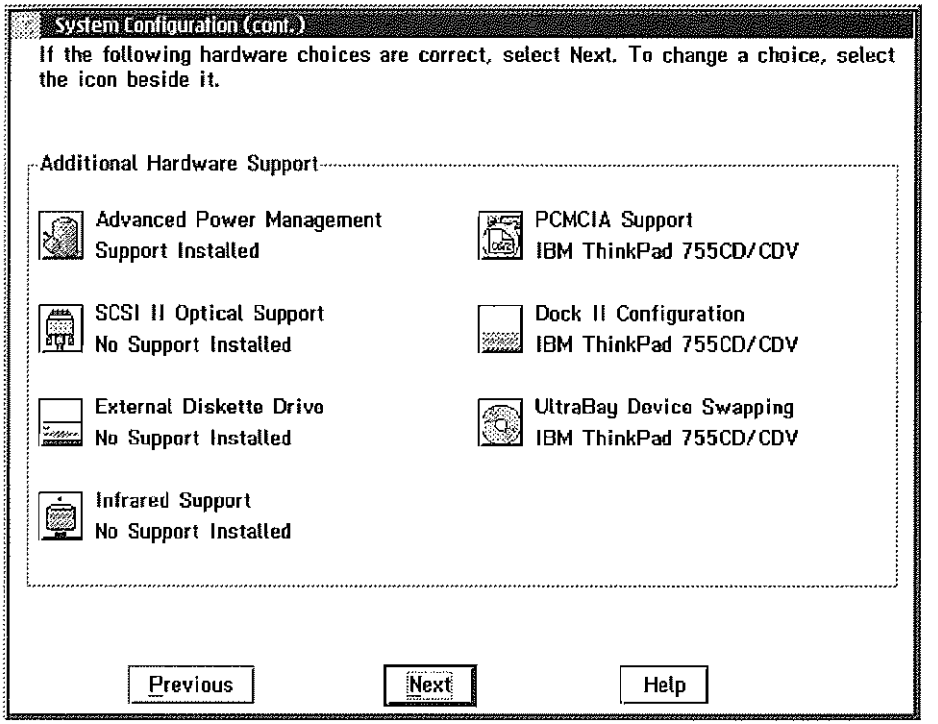

Figure 7. System Configuration (cont.)

The following items can be configured from this panel:

- Advanced Power Management (APM)
- SCSI II Optical Support
- External Diskette Drive
- Infrared Support
- PCMCIA Support
- Dock II Configuration
- UltraBay Device Swapping

For each of the components you can click on the **Icon** next to it for further configuration. Click on **Next** to continue.

The next panel that appears is the Type of Activities panel. From this panel select the connectivity activities you want to install. Two choices are available:

- Let me install services for these activities

  If this option is selected you have the following three options:

  1. Access the Internet

2. Connect directly to a LAN
3. Connect to a LAN remotely using a modem

Based on selections you make out of the above you will be asked to provide certain information in the panels that follow.

Each subsequent panel will prompt you for certain information. First it will confirm if you want to install a specific activity. If you confirm it will prompt you for some additional information regarding the specific activity.

A ready-to-install window is displayed and you must click on **Install** to continue.

- Let me choose from all the services

  If this option is selected you will be guided through panels with questions about all the available services.

  If this option is selected each available service is listed and you are prompted whether you want to install it. If your reply is positive you need to answer some specific questions. Finally you select your network adapter card.

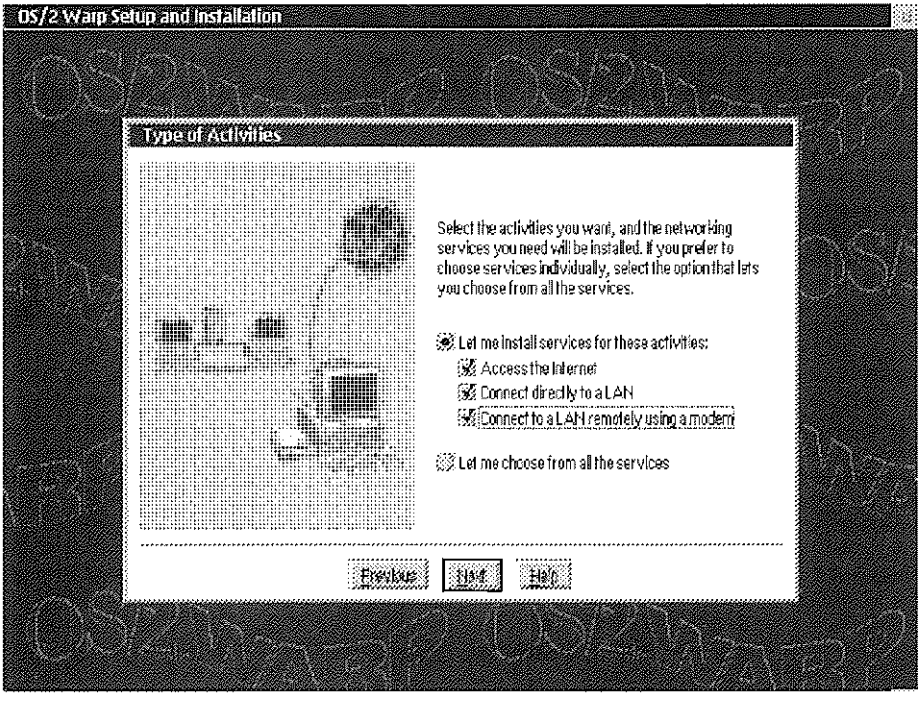

Figure 8. Type of Activities

Make your selection by clicking on the appropriate radio button. The Type of Activities panel is shown in Figure 8.

Follow through the additional panels until you get to the final confirmation panel. Click on **Install** to continue. The Ready to Install panel is shown in Figure 9.

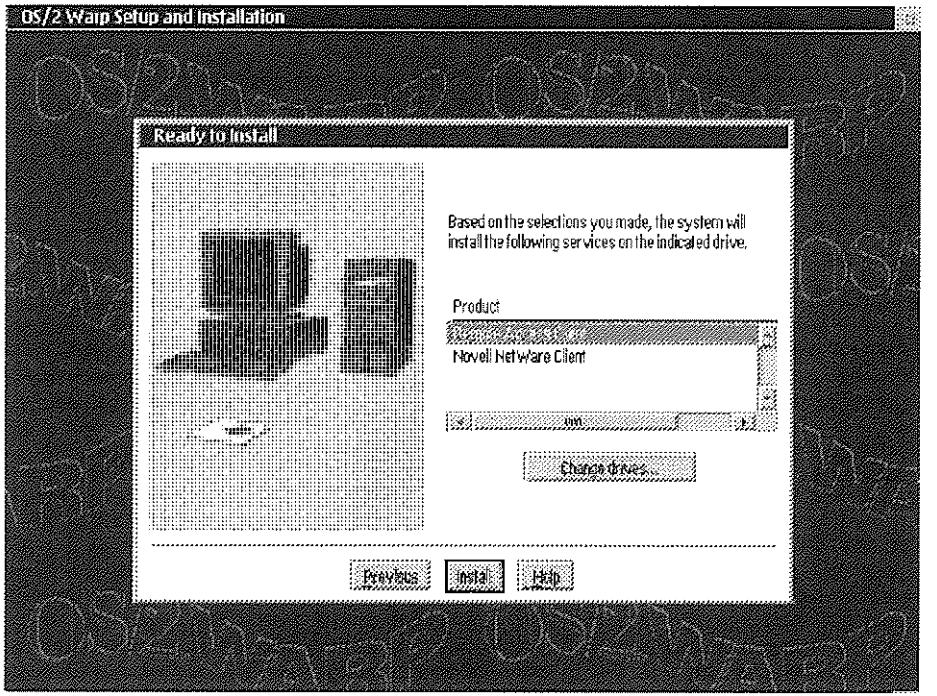

Figure 9. Ready to Install

The selected files are now copied to your disk. The system will typically reboot once during the installation and again at the very end. When the Welcome to OS/2 panel appears, the installation is complete and the system is ready for use.

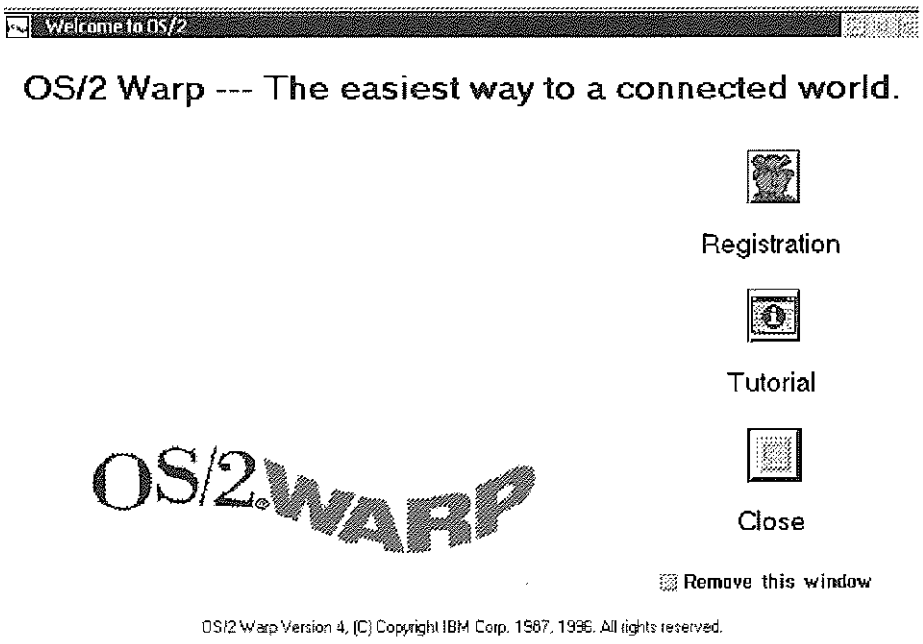

Figure 10. Welcome to OS/2

The Welcome to OS/2 panel is shown in Figure 10. From this panel click on one of the following three icons:

- Registration

  Use this to register your software with IBM.

- Tutorial

  The OS/2 Warp 4 tutorial allows you to practice concepts end provides good initial tips and techniques.

- Close

  Close the welcome panel.

This panel will be displayed at every boot until you click on the **Remove this window** check box.

2.5 Advanced Installation

The advanced installation allows you to install OS/2 Warp 4 onto your machine with a bit more control. You can select drives, partitions, file systems and the components of OS/2 Warp 4 that you want to install.

From the Installing OS/2 Warp 4 panel press the 2 key to invoke the advanced installation process. The Installation Drive Selection panel is displayed and you are prompted to select your installation drive. This is normally the C drive and the default drive where OS/2 Warp 4 will be installed to. Two choices are available:

- Accept the drive.

  If you accept the drive the installation program starts loading the system files and then displays the Formatting the Installation Partition panel. From this panel you can choose to:

  - Format the partition
  - Do not format the partition

  If you select not to format the drive the installation process continues and upgrades the currently installed operating system.

  Note

  If no operating system exists or the disk has no file system installed, the installation process formats the disk automatically after prompting you for the type of file system.

  If you choose to format the partition you are presented with two choices:

  - High Performance File System (HPFS)
  - File Allocation Table file system (FAT)

  2.1.2.3, "FAT or HPFS?" on page 18 provides information on the two file systems. Make your selection and continue with the installation. The system shows a warning message informing you that all data on the disk will be lost. The disk is formatted and the installation continues.

- Specify a different drive or partition.

  A warning message is displayed informing you that any changes you make will result in data loss.

  The FDISK panel is displayed. From this panel you can specify the partition you want to install to, create one or more partitions, specify the physical disk you want to use, install Boot Manager, specify active partitions and add or remove partition names to and from the Boot Manager Menu.

  A partition of at least 100 MB must be set to installable. When you have made your selection you must exit the FDISK program. It will save your changes and you have to reboot the system for these changes to take effect. See 2.1.2, "Partitioning and Formatting Your Hard Disk" on page 15 for more information.

  After the subsequent reboot you will again see the Installing OS/2 Warp 4 panel. Choose **Advanced** and from the Installation Drive Selection panel, select **Accept the drive**, since the changes you've made previously are now reflected on this panel.

The system files are now copied to your local disk. This is followed by the copying of disks 3 to 11. After diskette 11 has been copied, the Installation diskette, Diskette 1 and finally Disk 2 are copied.

Some more system files are now copied as well as the OS/2 Warp Installation program. A final installation check is done before the system prompts you to remove the diskette from the drive and to press Enter to restart the workstation.

After rebooting, the system objects are created and the System Configuration program is loaded. During system configuration, OS/2 Warp 4 discovers the devices that are installed on your workstation.

The System Configuration panel appears after the core operating system is successfully copied to the hard drive. The panel shows all of the hardware that OS/2 Warp 4 has recognized and configured for you. This panel is shown in Figure 11.

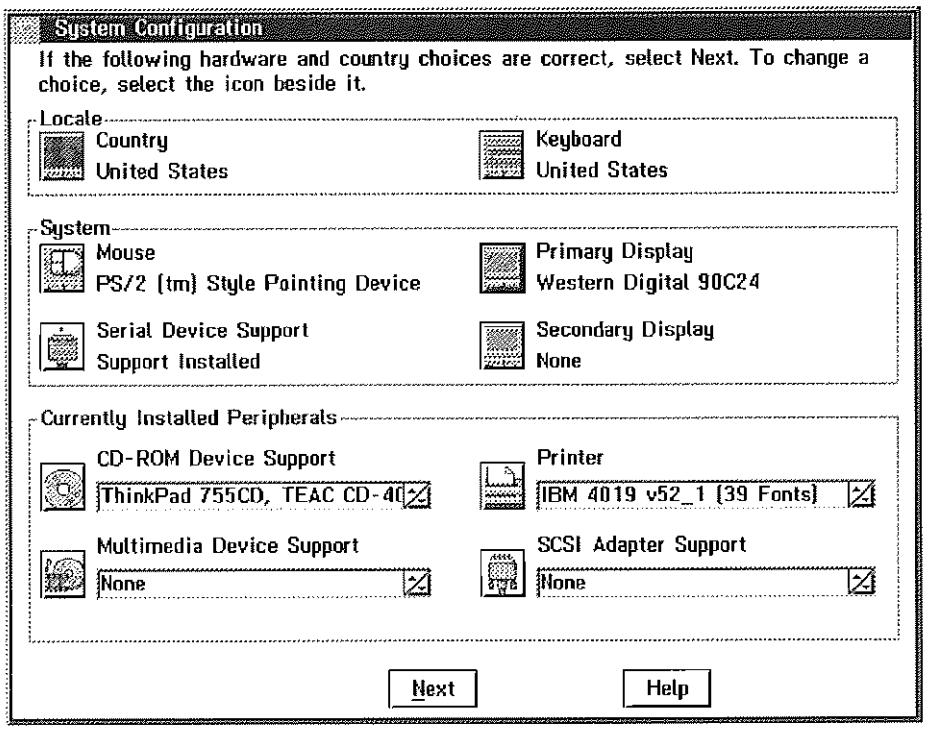

Figure 11. System Configuration

If any of the items are incorrect, then click on the icon next to the component and select the correct option from the list of available devices. Alternatively you can use device

drivers supplied by the manufacturer. When all your selections are correct, click on **Next** to continue.

This will bring up the panel shown in Figure 7 on page 41.

Note

At this stage you can click on the **Primary display** icon and select your display adapter. You can also click on the **Printer** icon to select your default printer.

However, the advanced installation process will prompt you for the display adapter and default printer at a later stage. If you are happy with the other selections that have been made, you can click on **Next** to continue.

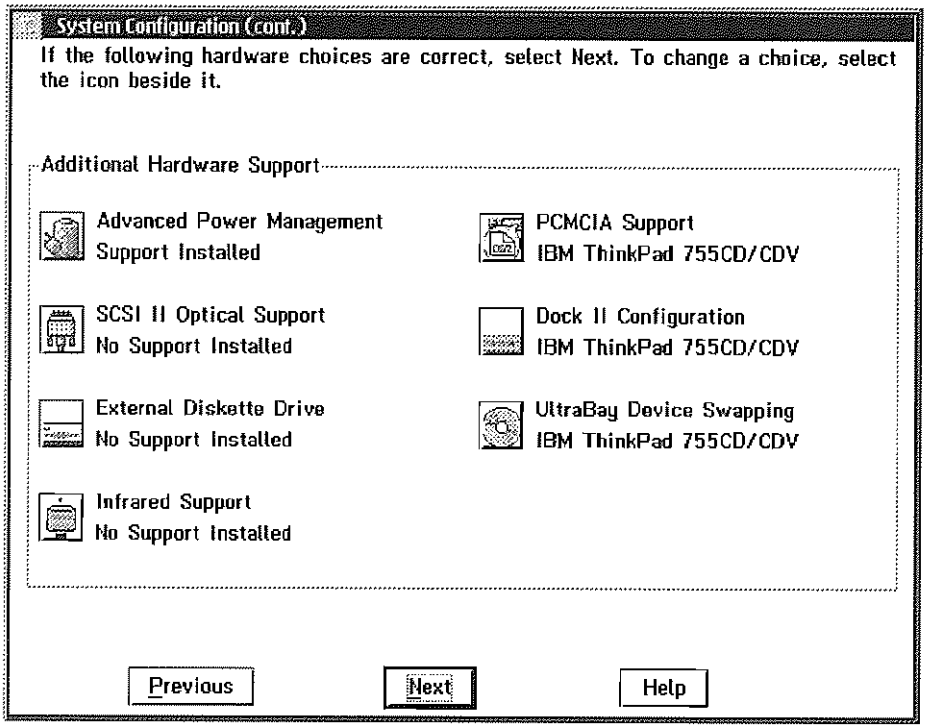

Figure 12. System Configuration (cont.)

The following items can be configured from this panel:

- Advanced Power Management (APM)
- SCSI II Optical Support

- External Diskette Drive
- Infrared Support
- PCMCIA Support
- Dock II Configuration
- UltraBay Device Swapping

For each of the components you can click on the **Icon** next to it for further configuration. Click on **Next** to continue.

If you did not select a printer, the OS/2 Warp 4 install program will present you with a list of printers from which you can select a default as well as additional printers.

OS/2 Warp 4 now attempts to discover your video adapter and awaits a confirmation from you. The Display Driver Install panel is shown in Figure 13.

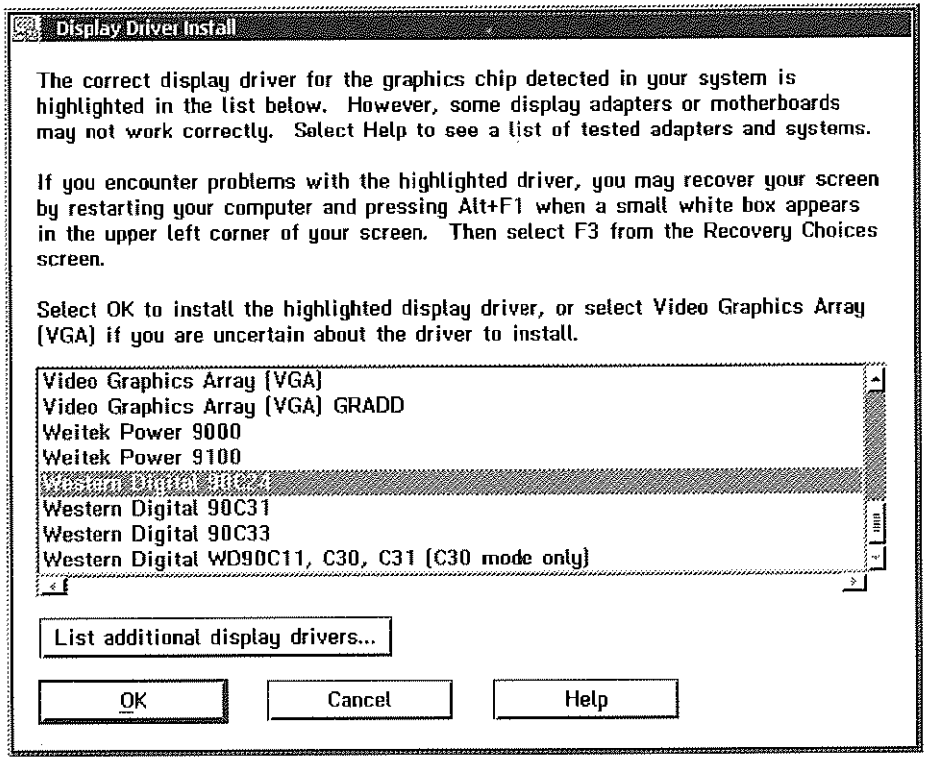

Figure 13. Display Driver Install

Figure 14 on page 49 is now displayed. From this panel you can select the features you want to install as well as configure some additional options. See 2.6.1, "Installing

and Configuring Video Adapters" on page 56 for additional information on installing video drivers.

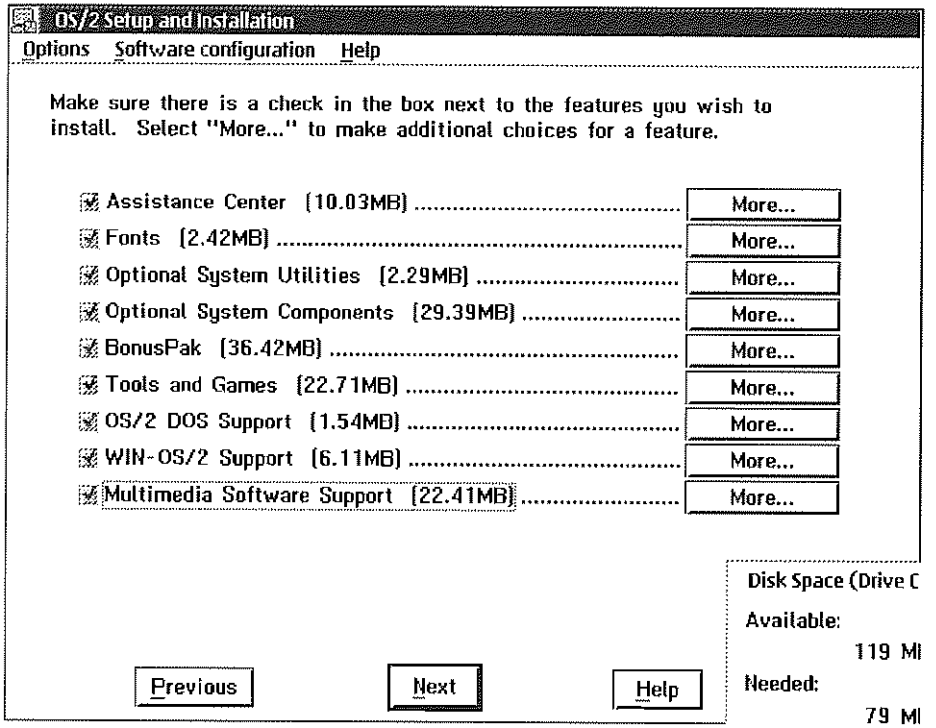

Figure 14. Setup and Installation

The choices include Optional System Utilities, Optional System Components and the BonusPak. To install a feature check the box next to it. To install and configure additional parameters, click on the **More** button on the right-hand side.

The information window at the bottom right-hand side gives you an indication of how much disk space is available and how much is needed for your selected features.

Some optional system components are included. They are:

- OpenDoc

  A compound document architecture that provides the basis for compound documents

- VoiceType

IBM's speech recognition technology, including navigation and dictation. See Chapter 7, "The VoiceType Dictation Function" on page 707 for a detailed explanation of Voice Type.

- Security

  A security layer that allows to hook in a third party security module.

- Dedicated DOS/Windows Session

  This a kind of trapdoor feature that allows the user to enter a dedicated DOS or DOS/Windows session. It only works on systems with DOS or DOS/Windows installed and that uses an IDE disk, formatted with the FAT file system. The Easy installation process installs this if all the criteria are met.

  Dedicated DOS/Windows Mode applications should be installed in a standard Dual Boot environment. This allows you to verify that the application works correctly in its native environment and it allows the DOS CONFIG.SYS to be modified if necessary without interfering with the OS/2 Warp 4 CONFIG.SYS.

  The applications are then migrated by clicking on **Add Programs** in the System Setup folder. Dedicated DOS/Windows Mode applications must be installed on a FAT disk partition as HPFS partitions are not accessible from DOS/Windows. Remember that when you are executing in the Dedicated DOS/Windows Mode environment that you are running the application in its native environment.

  The FAT disk partition must also be located on an IDE disk drive. The OS/2 Warp 4 installation program checks for this and will not install the Dedicated DOS/Windows Mode feature if your system is not configured properly with an IDE drive. The hibernate/resume logic use the generic INT 13 BIOS interface to perform its functions. This logic works with many SCSI disk devices. However, some SCSI device drivers put the disk/adapter in such a state that it cannot be accessed through the INT 13 interface. This prevents the hibernate logic from working correctly.

  If you wish to install the Dedicated DOS/Windows Mode feature on your SCSI disk, insert the following command in CONFIG.SYS after the first phase of installation is complete.

  ```
  SET TRUEMODE=1
  ```

  When the first phase of installation is complete, you are instructed to reboot the system. Press F3 at this point to go to a command line and edit CONFIG.SYS. Although this feature will work on many SCSI systems it is *not* a supported feature.

  If you want to trapdoor to Windows applications, you must have a copy of Windows already installed.

Installing OS/2 Warp 4 over Windows 3.1

OS/2 Warp has always provided support for running your Windows 3.1 applications. Simply install OS/2 Warp 4 over your existing DOS and Windows 3.1 installation, and OS/2 Warp 4 automatically migrates and runs your Windows 3.1 programs. It

also sets up DUAL BOOT automatically, so you can switch between OS/2 Warp 4 and DOS/Windows.

Installing OS/2 Warp 4 over Windows 95

When installing OS/2 Warp 4 on a system that already has Windows 95, be careful about automatically migrating programs to the Workplace Shell desktop. While OS/2 Warp 4 can run WIN32S applications, it can't currently run Windows 95 programs. Messages such as `DOS Error 23` or `You need a new version of WIN-OS/2`, mean you're trying to run a Windows 95 application that currently does not run under OS/2. When installing OS/2 Warp 4, instead of migrating all applications automatically to your OS/2 Workplace Shell desktop choose the **Select New Programs** option. This allows you to select/deselect which applications to add. Avoid any applications in the \PROGRAMS and the \WINDOWS directory if that's where you installed Windows 95.

Installing Windows 95 over OS/2 Warp 4

If your system already has DOS, Windows 3.1, and OS/2 Warp 4 installed in a single disk partition, you can dual boot to DOS, load Windows, and run the Windows 95 Setup program. Do *not* install Windows 95 into the \WINDOWS directory, or you'll disable OS/2 Warp 4's capability to run Windows 3.1 applications. Windows 95 overwrites Windows 3.1 programs to reuse disk space. Install Windows 95 into a separate directory.

- High Performance File System

  The device drivers for HPFS

Figure 15 shows the Optional System Components panel.

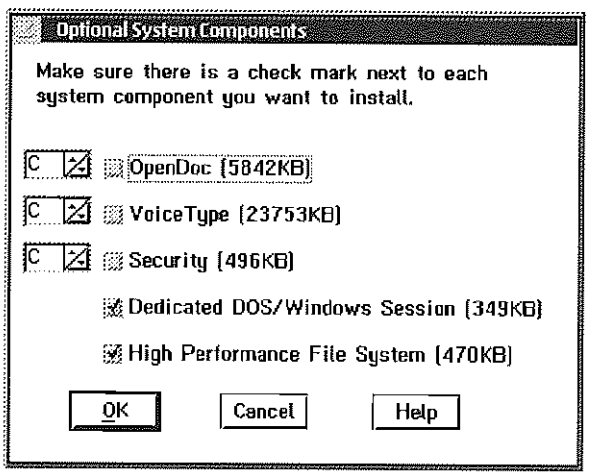

Figure 15. Optional System Components

In the OS/2 Setup and Installation panels you can change some software configuration. From the **Software Configuration** pull-down menu you can change some OS/2 and DOS parameters. The OS/2 parameters you can change are:

Printer Monitor Buffer size	The printer buffer size.
Buffers	The buffer size.
Diskcache	The amount of disk cache available to the system.
Maxwait	The maximum wait time.
Swap Minfree	The minimum amount of free disk space available to the swapper file before a warning message is generated.
Threads	The number of threads available to the system.
Swappath	The path to the SWAPPER.DAT file.
Memman Protect	Enables certain APIs to allocate and use protected memory. Also known as protected dyna-links.
Memman Swap	SWAP or NOSWAP permits or prevents segment swapping.
Priority	Selects priority calculation in scheduling regular class threads.

Most of the options in the OS/2 software parameters will be covered in more detail in 2.10, "Tuning for Performance" on page 117.

In addition to the OS/2 parameters, a number of DOS parameters can also be configured. The DOS parameters are shown in Figure 16 on page 53.

The DOS parameters are:

Break On/Off	The ability to break a DOS program
Open FCBS	The number of file control blocks
Protected FCBS	The number of FCBS to protect
RMSIZE	The default RAM size of a DOS session

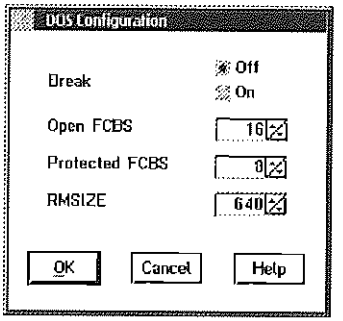

Figure 16. DOS Parameters

The DOS parameters will also receive more detailed attention in the Tuning for Performance section. See 2.10, "Tuning for Performance" on page 117.

The BonusPak

The BonusPak is a set of software utilities that ships as part of OS/2 Warp 4. The BonusPak used to ship on a separate CD but is now incorporated as part of the OS/2 Warp 4 base CD. The BonusPak installation is part of the standard Setup and Installation of OS/2 Warp 4. To install the BonusPak, check the box next to it. To select and configure additional parameters click on the **More** button on the right-hand side.

Figure 17 shows the BonusPak installation panel.

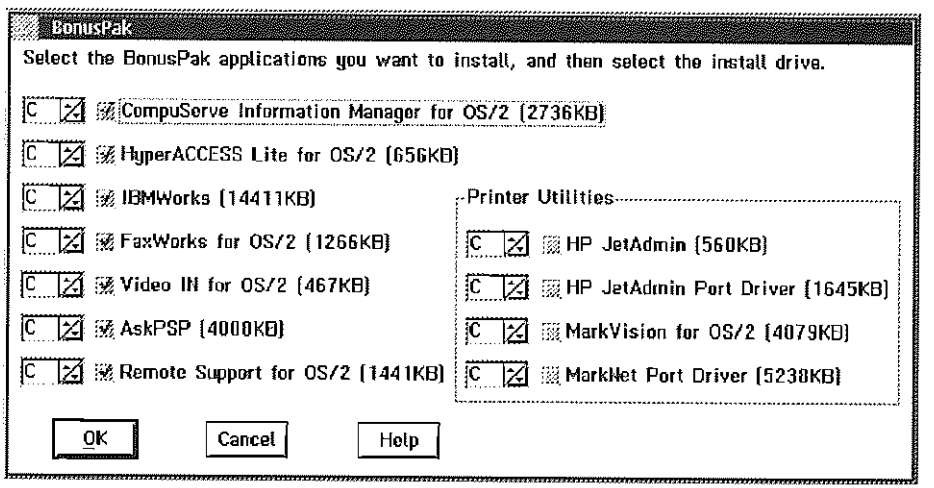

Figure 17. BonusPak Installation

Make your selection of BonusPak applications by checking the box next to each application. By clicking on the spin buttons next to each application you can determine which drive you want to install the application to. Once all your choices have been made, click on **OK**.

This will return you to the OS/2 Setup and Installation panel. Once all your changes are made and all additional configurations are done click on **Next** to continue.

The Advanced option panel is displayed. From this panel you can select to:

- **Add existing programs to your Desktop**

  If you select this option the system will scan all available drives on your computer in search for existing applications. Any application that's found will be migrated to the OS/2 Warp 4 desktop.

- **Migrate your existing configuration files with your new configuration files**

  This option will migrate the existing configuration files such as CONFIG.SYS and AUTOEXEC.BAT to the new files. The reason for this is to add any specific statements that you may have had in the existing files to the new files.

- **At the conclusion of the installation, view and edit migration results**

  This option allows you to view any migration results prior to them being written to disk.

Figure 18 on page 55 shows the advanced options. Make your selections and click on **OK** when done.

Note

You can also install the BonusPak using the Selective Install procedure. See 2.6, "Selective Install" on page 55 for more information about the Selective Install procedure.

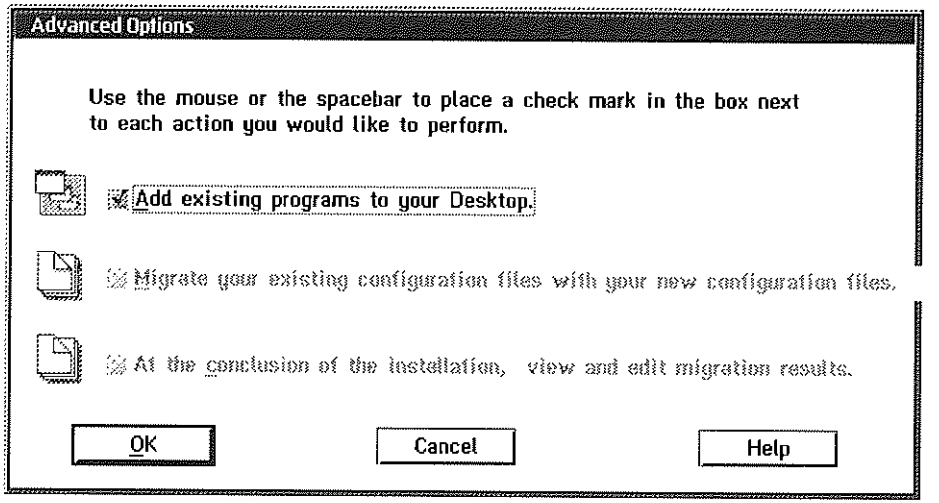

Figure 18. Advanced Options

The next panel that is displayed is the OS/2 Warp Setup and Installation panel for networking. From this panel you will select which networking components you want to install.

When all parameters are filled in, click on **Install** to complete the installation.

The installation process now copies the selected files to your disk. First it copies the base operating system followed by the display drivers, printer drivers and BonusPak. This is followed by the networking components. The system will normally reboot once during the installation and again at completion.

When the system restarts, the Welcome to OS/2 panel will be displayed and the system is ready for use. The Welcome panel will be displayed every time you restart your computer until you switch it off. See Figure 10 on page 44.

2.6 Selective Install

The Selective Install program of OS/2 Warp 4 gives you the ability to add or re-configure system components after installation. It works similar to the Advanced Install program and uses the same panel and windows to guide you through the installation process. Let's have a look at a couple of things that Selective Install can do for you.

To start the Selective Install procedure do the following from the OS/2 Desktop:

1. Double click on the **OS/2 System** Folder
2. Double click on **System Setup**

3. Double click on **Install/Remove**
4. Double click on **Selective Install**

2.6.1 Installing and Configuring Video Adapters

Depending on which installation method you have used, OS/2 Warp 4 could have automatically detected your video adapter and installed the appropriate driver. The Easy installation, however, will only install a VGA driver unless you specified otherwise.

If you wish to change your currently installed video adapter or want to upgrade from VGA (640x480 16 colors), then you will use the following procedure.

2.6.1.1 Upgrading from VGA

If your system is configured for VGA graphics (that is, you are only getting a resolution of 640x480 and 16 colors), and you want to upgrade, do the following from the OS/2 Desktop:

1. Double click on the **OS/2 System** Folder
2. Double click on **System Setup**
3. Double click on **Install/Remove**
4. Double click on **Selective Install**

   This will start the OS/2 Setup and Installation program and load the System Configuration program. See Figure 11 on page 46 for a graphical view of the configuration panel.
5. Click on the **Primary Display** icon.

   This will bring up the Display Driver Install panel. The install program will highlight the graphics chip detected in your system. The Display Driver Install panel in shown in Figure 13 on page 48.
6. Click on **OK** to continue.

   This will return you to the System Configuration panel.
7. Click on **Next** to continue.
8. In the OS/2 Setup and Installation panel, click on **Next** to continue.
9. Specify the source drive and directory, that is the drive that contains the OS/2 Warp 4 source files.
10. Click on **Install** to continue.

Note

If your display adapter type is not listed or if you are unsure, select the **VGA** option. If you select the wrong adapter or encounter problems with the driver you are using, press Alt+F1 when restarting your system and by using the recovery choices, restore back to VGA mode.

2.6.1.2 Changing Your Display Adapter

If you are changing your display adapter to one using a different chip set, use the following procedure:

1. Reset your system back to VGA mode

   The easiest way to do this is to press Alt+F1 when rebooting the system. From the recovery choices select **Restore to VGA** and reboot.

2. Install the new Video Adapter

   Power off your system and remove any cables attached to it. Open the covers and remove the old adapter. Install the new adapter and close the covers. Attach all cables.

3. Power up and reboot the system

   The system now boots in VGA mode.

4. Follow the instruction in 2.6.1.1, "Upgrading from VGA" on page 56 to install the appropriate display driver.

Important

Changing of display adapter cards, opening of system covers and so on must be done by following the manufacturer's instructions.

If your display adapter was supplied with a specific OS/2 Warp 4 device driver follow the directions given by the manufacturer. These specific device drivers normally call the DSPINSTL utility that uses the same process as described above.

If you have a display driver with no additional documentation, follow the steps as described in 2.6.1.1, "Upgrading from VGA" on page 56. When the panel with the Primary Display Drives list is shown click on the **List additional display drivers...** button. You will be prompted to enter the path to the source of your display adapter device driver. The video adapter device driver will be installed and configured for use in your system. Reboot your system after all the changes have occurred and set your display resolution and number of colors desired.

2.6.1.3 Setting Display Resolutions

To select the required display resolution and number of colors:

1. Double click on the **OS/2 System** folder

2. Double click on **System Setup**
3. Double click on **System**

From the System Properties panel select the desired resolution. Note that the resolutions available to you depend on the type of video adapter you use and will vary from adapter to adapter. Certain display drivers will also add a second panel to the System Properties from which you can specify the type of panel you're attaching to your display adapter.

After you have made your selections, reboot the system for these changes to take effect.

2.6.2 Installing and Configuring Audio Cards

It is easy to add or change your audio adapter after the installation of OS/2 Warp 4. Simply use the Selective install program.

If the sound card is not already installed, follow the manufacturer's instructions and install the sound card into your system. Make sure to set the card up to use only the available hardware settings such as IRQ, base I/O and DMA. After you have made the necessary hardware changes, power on your system and start the Selective Install program by:

1. Double clicking on the **OS/2** System folder
2. Double clicking on **System Setup**
3. Double clicking on **Install/Remove**
4. Double clicking on **Selective Install** This will start the OS/2 Warp 4 setup and installation program and present you with a panel similar to those in the initial installation process. See Figure 11 on page 46 for an illustration of the System Configuration panel.
5. Your new audio adapter should now be listed in the Multimedia Device Support section of this panel. Click on the icon next to Multimedia Device Support. This will present you with a list of supported multimedia devices.
6. The device installed in your machine will be listed on the right hand side under Device(s) in System to be Installed. If your device is not listed on the right-hand side you can select it from the list of supported devices and add it to the list of devices to be installed. See Figure 19 on page 59.

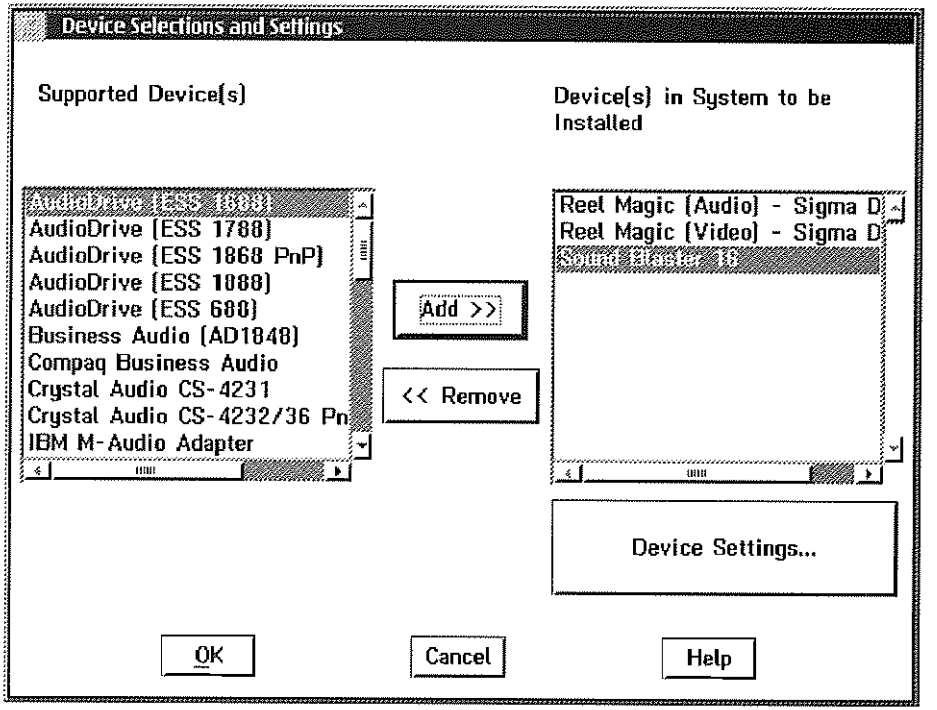

Figure 19. Device Selections and Settings

7. If you have changed any hardware settings on any of the device click on **Device Settings** and make sure that the correct values are used. Figure 20 on page 60 shows the settings for a Sound Blaster 16 device.

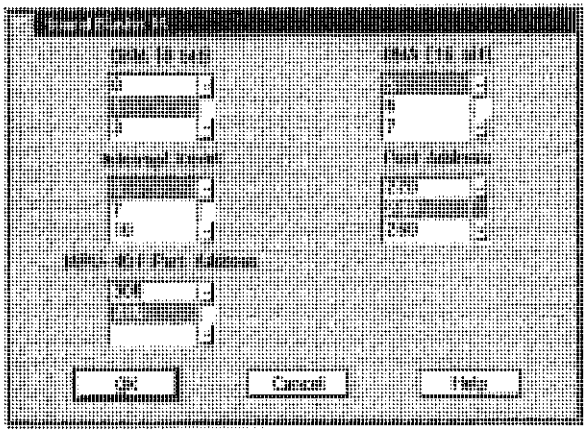

Figure 20. Sound Blaster 16

In order to obtain sound in a DOS and DOS/Windows session, keep the following in mind. Some sound cards have virtual drivers supporting sound in a DOS or DOS/Windows sessions. For this type of sound card, simply install the drivers by following the instructions in the documentation provided with the sound card.

8. For adapters without virtual drivers, such as Sound Blasters, use the DOS and Windows drivers that shipped with the adapter. After you installed sound support for OS/2 as discussed above, load a Full Panel DOS Session and simply install the sound drivers as you would have done in a native DOS environment. Set up your Windows environment in a WIN-OS/2 Full Panel Session as you would have done in native Windows.

   Important

   If your sound card or any other multimedia device supports Plug and Play, you will not have to set any switches. The system will detect the type of hardware adapter and inform you whether or not any device setting are possible. The Sound Blaster 16 PnP device, for example, has no device settings.

9. Once all settings are checked and you are happy that everything is correct, click on **OK** to continue. This will return you to the System Configuration panel.
10. Click on **Next**. On the additional Hardware Support panel you can also click on **Next**.
11. You shouldn't have to make any selection on the OS/2 Setup and Installation panel so you can click on **OK**. The installation of your new multimedia device will continue.

Note

If this is the first time you install an audio card in your system you might want to make sure that Multimedia Support has been installed previously. If it has not been installed you can select it from the OS/2 Setup and Installation panel before you complete your multimedia device installation.

Tip

If you use a Sound Blaster or compatible card together with a token-ring adapter it is advisable to change the base memory Port Address on the Sound Blaster card from 220 to 240. Remember if you do this on the older type Sound Blaster adapters you have to make a physical switch setting or jumper change on the card and also change the device settings as described above.

2.6.3 Installing and Configuring PC Cards

PC Cards, formerly known as PCMCIA adapters, are those little adapter cards that are so popular in notebook computers today. Installing them to work correctly is an altogether different story however.

In OS/2 Warp 4 you can install support for PC Cards either during installation (recommended) are at any time thereafter. The installation works as follows (either during installation or later).

From the Additional Hardware Support Panel in the OS/2 Warp 4 Easy, Advanced or Selective Install procedure, click on the **PCMCIA Support** icon. A list of selected PCMCIA systems are displayed. The PCMCIA chip in your computer determines what system you have to use and the correct system is highlighted.

Select the PCMCIA options you want to install from the right-hand side. The options are:

- PCMCIA Modem/FAX
- PCMCIA Hard Disk
- PCMCIA Flash

It is important for you to know what it is you want to use PC Cards for. If you are not going to use flash or hard disks, don't install this features. If you only intend to install PCMCIA support for network adapters you don't have to select any of the options. It is advisable, however, always to select the **Modem/FAX** option. This option is selected by default. Click on **OK** when all selection have been made. Continue with the installation.

Note

If you select the PCMCIA hard disk support, two additional drive objects will be created in your drives folder representing the ATA disk.

After your PC Card support is installed and the system has rebooted, double click on the **Plug and Play for PCMCIA** folder in the System Setup folder to get access to the PC Card utilities. The folder is shown in Figure 21.

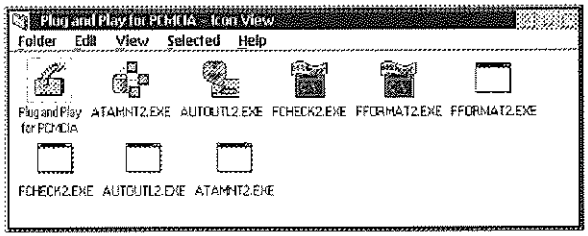

Figure 21. Plug and Play for PCMCIA - Icon View

There are a couple of important icons in this folder:

- Plug and Play for PCMCIA

  Double click on this to launch the Plug and Play utility. This utility is used to graphically represent to you which cards are installed in your system and what status they are in. It also has a Launcher icon that shows what object will be launched if you have registered a launch object.

  If you click on the card icon it will provide you with the card settings. This contains information about the card such as the name, the launch object and condition and the sound to make when the card is inserted, removed or ready.

  If you click on the status icon for a specific card you will get information regarding the card's resources such as IRQ levels and memory addresses. Other information such as voltage levels is provided in the Information tab, and the Client tab provides information about the card such as type, revision, Card Services level and so on.

  It is important to note that a PC Card is only usable when the status is shown as Ready.

  If you click on the Launcher icon for a specific card, it will launch the object that was set up in the card settings.

- Auto Configurator Utility

  Select cards from the list of available cards to be added to the list of selected cards. Select a card and click on **Edit** to edit the parameters for a card. These parameters are options such as card ID, IRQ level, memory address and a description of the

card. When a card is added to the auto configurator it will automatically adopt the settings in the configurator when it is inserted.

- PCMCIA ATA Card Mount Utility

  This utility is used to mount the ATA hard disk. You have the option to mount or remove the ATA disk.

The Plug and Play for PCMCIA utility program is shown in Figure 22.

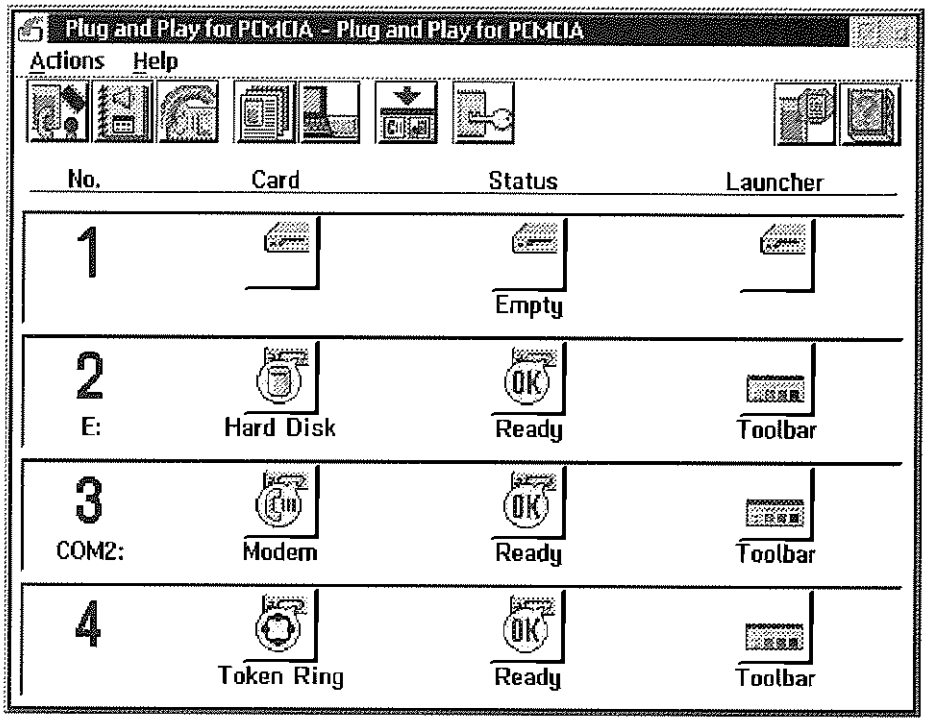

Figure 22. Plug and Play for PCMCIA - Icon View

2.7 Selective Uninstall

The Selective Uninstall process allows you to selectively uninstall certain components from OS/2 Warp 4. To access the Uninstall utility do as follows:

1. Double click on the **OS/2 System** folder
2. Double click on **System Setup**
3. Double click on **Install/Remove**

4. Double click on **Selective Uninstall**

This will load the Uninstall program and present you with the Selective Uninstall panel. To select a component for uninstall, check the box next to it.

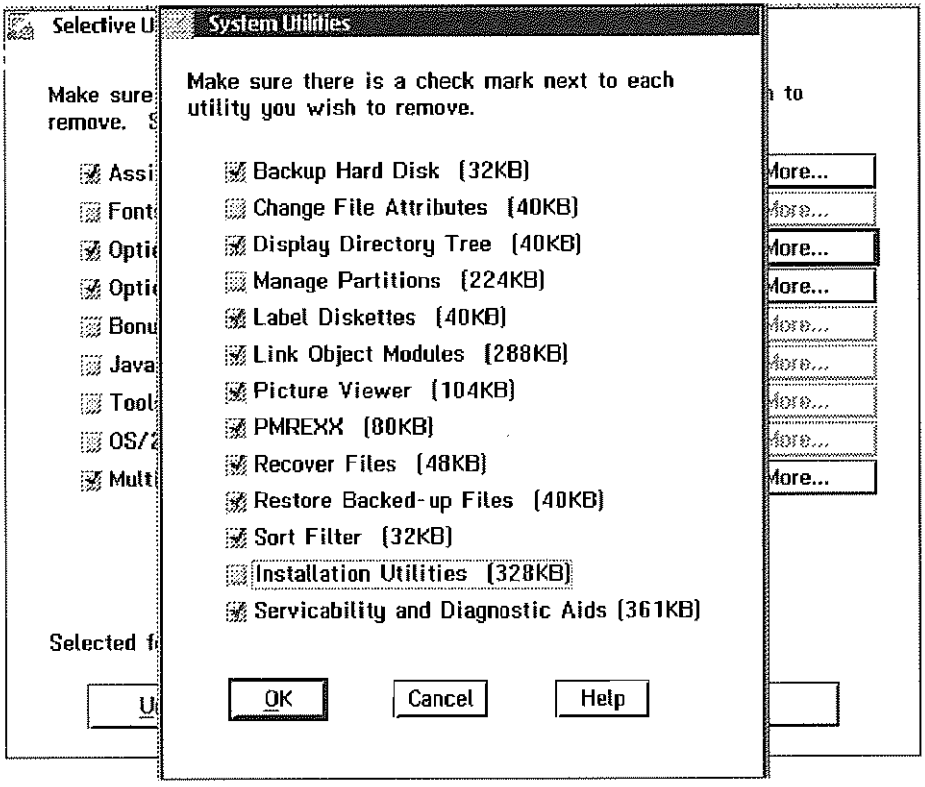

Figure 23. Selective Uninstall

This will uninstall all subfeatures that could be contained within it. Click on the **More** button on the right-hand side of the feature and deselect the items you do not want to uninstall. All items will be selected for Uninstall by default. Figure 23 illustrates the uninstall process.

Once you have made all your selections, click on **Uninstall**. The selected features will now be uninstalled.

The features that can be uninstalled are:

- Assistance Center
- Fonts

- Optional System Utilities
- Optional System Components
- BonusPak
- Java Development
- Tools and Games
- OS/2 DOS Support
- Multimedia Software Support

When uninstalling components it is always important to carefully consider what impact this can have on the rest of the system. For example, if you uninstall the Assistance Center, you may not have the same level of online help as you had before.

2.8 System Setup

Miscellaneous utilities are available to customize the way OS/2 looks, feels and behaves. You can change colors, fonts, backgrounds, etc. There are also utilities that allow you to install additional device drivers and fonts and add applications. Let's have a look at a few of these capabilities.

2.8.1 Installing and Configuring Mwave

The following procedure describe the installation and configuration process for the Mwave Version 2.02 drivers on the IBM ThinkPad 755 and 760 series machines.

Note

The ThinkPad should be placed on AC power and logged off of any network connections prior to beginning the Mwave installation. Failure to do so can cause various inconsistencies in the Mwave installation which will prevent Mwave from functioning normally. After successful installation, the ThinkPad can be run as it was before.

Always make sure that base Multimedia Support is installed and functioning before you start the Mwave installation. If Multimedia Software support was not installed during the installation of OS/2 Warp 4, use Selective Install to install the support. The hardware selection on the System Configuration page should be "None." For the ThinkPad 755CD/CDV and 760CD/ED series, CD-ROM support must be present (support should have been installed when OS/2 was installed) on the machine. This is important since failure to do so will cause the absence of a CD Audio object in the Multimedia folder. Perform a proper shutdown and reboot the system.

Note

If you attempt to install the Multimedia Support with a sound device or if multiple Digital Audio or other icons appear in the Multimedia folder, then Multimedia Support must be removed completely and reinstalled. Click on **OS/2 Warp 4 Selective Uninstall** in the System Setup folder to remove Multimedia Support.

2.8.1.1 Start the Mwave Installation

It is important to install Mwave support in the correct sequence. The sequence is:

1. ThinkPad Mwave Management Device Driver

   Install the ThinkPad Features for OS/2 using the INSTALL2 program from the ThinkPad Utility diskette 1. The INSTALL2 program can be run from an OS/2 window. Remove the check on the Install Personalization Editor, select **Install**, and follow the instructions to complete the installation. After the installation completes, double-click on **Device Driver Install** in System Setup. Insert the ThinkPad Utility diskette 2, select **Install** and choose the **ThinkPad System Management Device Driver** (make sure to highlight this selection). Perform a proper shutdown and reboot the system. Verify that the following line is placed in the CONFIG.SYS:

   ```
   BASEDEV=AODBSMD.SYS
   ```

   This driver *must* be present in order for Mwave to function. For best results, this line should come before the Mwave lines in CONFIG.SYS as shown in the sample CONFIG.SYS on the following page.

2. OS/2 Mwave Support

   Install Mwave support by using the SETUP command from the ThinkPad Mwave OS/2 Disk 1 in an OS/2 window. After the second disk is read, there should be a confirmation message: `OS/2 Mwave Manager Operating System Installed.` Perform a proper shutdown and reboot.

   During boot up, there should be a message `MWAVEDD.SYS` and an Mwave for OS/2 icon should appear on the Desktop.

3. OS/2 Mwave Audio Support

   Install Mwave Audio support (excluding MIDI), by using the SETUP command from the ThinkPad Mwave Audio for OS/2 Warp disk in an OS/2 window. Select the IBM Mwave Adapter (this is the default). Perform a proper shutdown and reboot the system.

4. OS/2 Mwave MIDI Support (Optional)

   For Mwave MIDI support, run the SETUP command from the ThinkPad OS/2 MIDI Support Disk from an OS/2 window. Answer Yes to the prompts for OS/2 MIDI samples. When the program asks for Disk 2, insert ThinkPad MIDI Samples Disk 2. For Disk 3 use MIDI Samples Disk 3 and so on through all five of the MIDI samples diskettes.

The OS/2 CONFIG.SYS should reflect the following changes:

```
*
REM ********************************************************
REM Note: The Mwave MWAVEVDD.SYS device driver MUST be loaded *
REM       before the VEMM.SYS OS/2 driver in the CONFIG.SYS.  *
REM ********************************************************
DEVICE=C:\MWAVEOS2\BIN\mwaveVDD.sys
*
DEVICE=C:\MWAVEOS2\BIN\mwbd0400.sys BUS=1150000
```

(This line will usually be near the COM.SYS driver.)

```
*
SET MMBASE=C:\MMOS2;
SET DSPPATH=C:\MMOS2\DSP;
SET NCDEBUG=4000
DEVICE=C:\MMOS2\SSMDD.SYS
DEVICE=C:\MMOS2\R0STUB.SYS
*
BASEDEV=AODBSMD.SYS
*
SET MWFT_PATHNAME=C:\MWAVEOS2\DSP
SET MWPATH=C:\MWAVEOS2\MWAVEOS;C:\MWAVEOS2\DSP;C:\MMOS2\MWAVE
*
SET MWCARD=THINKPAD
SET MWROOT=C:\MWAVEOS2
SET MWOSNAME=MWOS2780.DSP
SET MWBIOS=MWBI0401.DSP
DEVICE=C:\MWAVEOS2\BIN\MWAGWVDD.SYS
DEVICE=C:\MWAVEOS2\BIN\MWSBVDD.SYS
DEVICE=C:\MWAVEOS2\BIN\MWAVEDD.SYS
DEVICE=C:\MWAVEOS2\BIN\MEI00430.SYS
RUN=C:\MWAVEOS2\BIN\MWSTART.EXE
*
```

Note that these changes, to function properly, should be in the order shown with the only exception as noted for the Mwave device.

Edit the CONFIG.SYS file to reflect the following changes:

```
DEVICE=C:\OS2\BOOT\COM.SYS (2,2F8,3)
```

The (2,2F8,3) is necessary to allow OS/2's COM driver to pick up the DSP modem, which is normally at COM2. If the DSP modem is set to COM1, then use (1,3F8,4).

If FaxWorks for OS/2 is installed, change the FMD.SYS line to:

```
DEVICE=C:\<path>\FMD.SYS (2,2F8,3)
```

where <path> is the subdirectory in which FaxWorks for OS/2 is installed.

Save the changes made to the CONFIG.SYS, shut down and reboot. The modem should be set up as a Class 2 device under FaxWorks.

2.8.1.2 WIN-OS/2 Mwave Support

Run the Setup program on the ThinkPad Mwave for Windows Disk 1 and follow the instructions. Make sure to run the Setup program from a WIN-OS/2 Full Panel session. For MIDI support, run the Setup program from the ThinkPad Mwave Windows MIDI Support Disk and follow the same instructions.

The following two lines should be added/appended in the AUTOEXEC.BAT in the root of the bootable drive:

```
SET BLASTER=A220 I5 D1 T1
SET PATH=...C:\MWAVEOS2\BIN;C:\MWW\DLL;
```

Note

If it becomes necessary to use Selective Install to reinstall WIN-OS/2 support, these two lines will have to be added manually to the AUTOEXEC.BAT for Mwave to function in WIN-OS/2 sessions.

2.8.1.3 Reinstallation of Mwave

If the Mwave installation becomes damaged and fails to function properly, it will be necessary to fully remove all Mwave *and* Multimedia Support prior to reinstallation. This is necessary to insure a clean reinstall of all features.

- Edit the CONFIG.SYS and remove all references to \MWAVEOS2.
- Do a Selective Uninstall of Multimedia Support and delete the Multimedia and Mwave folders from the Desktop.
- Shut down and reboot the system.
- Use the Drives object to remove the \MMOS2 and \MWAVEOS2 subdirectories.
- Proceed with the installation as outlined above.

WIN-OS/2 Mwave support can be reinstalled independently of OS/2 support. That is, if OS/2 Mwave support is working correctly, then it is not necessary to remove/reinstall OS/2 support in order to reinstall WIN-OS/2 support. In general, WIN-OS/2 Mwave support does not need to be removed before it is reinstalled.

2.8.1.4 Miscellaneous Application Considerations

For HyperACCESS, the modem type should be set up as an "Mwave Windsurfer Comm Adapter" or "Mwave 28,800 bps Modem" on whichever port (COM1 or COM2 only) that the modem is set for.

For communications programs that do not have a specific selection for the Mwave modem, choose a Hayes compatible.

For the modem to function with OS/2 telecommunications/fax programs, it must be initialized with the Mwave Modem icon in the Mwave for OS/2 folder. The Discriminator function will also launch. Neither the Modem nor Discriminator icons will be visible on the Desktop, but will show up in the Window List and can be selected if necessary.

If Audio is playing and an incoming telephone signal is detected by the modem, then the Mwave Manager will terminate the Audio automatically to free up the the necessary Mwave resources for the Discriminator/Modem. Audio should resume after the modem is through with its process (telephone, FAX, or Modem).

It is possible to use a PC Card modem and the DSP modem at the same time. Enable the DSP modem as COM2 (default). Use the ThinkPad Features to disable Infrared and Serial. Install PCMCIA support and select PCMCIA Modem/FAX as the device. The PCMCIA modem will show up as COM1 to applications. It is not possible to use the Serial ports or the Infrared in this configuration due to interrupt conflicts.

The first use of MIDI from the Media Player will give a warning `This file may not play correctly with the default MIDI setup.` Select the **Don't display this warning in the future** check box and continue.

For WIN-OS/2 sessions, the modem will function reliably with telecommunications programs only. The FaxWorks for Windows (CallCenter) will work reliably under WIN-OS/2. FaxWorks for OS/2 included in the Bonus Pak for OS/2 Warp works fine with WIN-OS/2 applications for faxing.

2.8.2 Installing OS/2 Warp 4 Fonts

During the OS/2 Warp 4 installation you get the opportunity to install the core IBM fonts. If you selected the advanced installation you can select which fonts you want to install. If you did not install all the fonts during the installation and now wish to add them to your system you can do the following:

- Start the Selective Install procedure.
- Continue until you get to the OS/2 Setup and Installation panel. See Figure 14 on page 49.
- Select **Fonts** and click on **More**
- Select the fonts you want to install.
- Click on **OK** to continue.

An alternative method is also available. Use this method to add fonts that are not part of the core IBM fonts.

Locate the Font Palette by:

1. Double clicking on **OS/2 System**
2. Double clicking on **System Setup**

3. Double clicking on **Font Palette**
4. To add a font, click on **Edit font...** and then **Add**. The system will now prompt you to provide location of the new fonts. Enter this information as Drive\Path.
5. Click on **Add...** when ready. A list of available fonts in this new location will be displayed. See Figure 24 for details.
6. Select the fonts you want to install, specify the target drive and directory and click on **Add** when done.

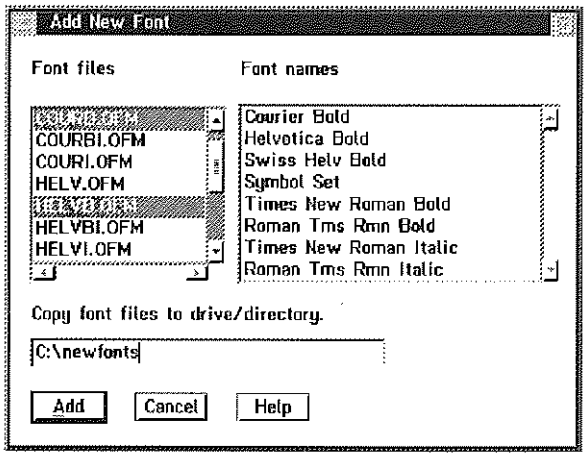

Figure 24. Select Fonts to Add

After all desired fonts have been installed you must reboot the system for the changes to take effect.

2.8.3 Application Migration

Applications in OS/2 Warp 4 can be migrated at various times. During the installation you can select from the Advanced Options panel to have existing programs added to your desktop. This is illustrated in Figure 18 on page 55.

If this selection is made the installation program will scan your disk during installation for any recognizable applications. It will search for OS/2, DOS and Windows applications. These application will be added to the Programs folder on your desktop and will be organized in an OS/2, DOS and Windows folder.

You can also migrate applications at any later time. To do this:

1. Double click on the **OS/2 System** folder
2. Double click on **System Setup**

3. Double click on **Add Programs**

This will open the Add Programs to the Desktop utility shown in Figure 25.

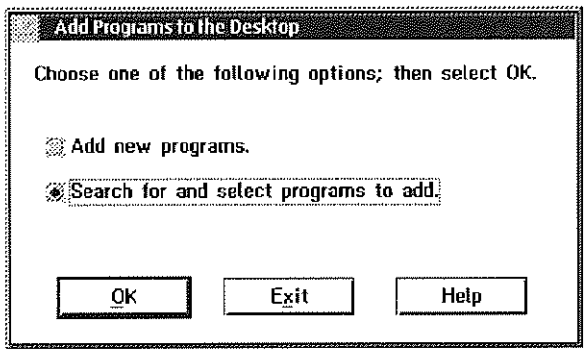

Figure 25. Add Programs to Desktop

Two options are given:

- Add new programs
- Search for and select programs to add

Selecting **Add new programs** will search your disk only for applications that have not been added previously. It makes use of a file called DATABASE.HST to keep track of which files have already been migrated.

Select **Search for and select programs to add** to get a list of all applications on your system. Select which ones you want to add, and click on **OK**.

On the following panel you can specify the search criteria. You can select which drives to search and what type of applications to look for. You can also specify which database file to use. (See 2.8.3.1, "How Does It Work?" on page 74 for more information.) Once you've made your selections click on **OK**. Figure 26 on page 72 illustrates this window.

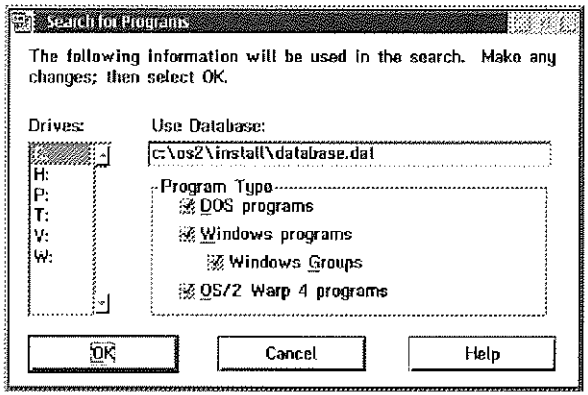

Figure 26. Search for Applications

Once you clicked on **OK** the search starts. The process will search all the drives you selected for possible applications to add. The migration utility test candidate applications against a database file before it adds them to your OS/2 desktop. Applications that not in the database file are not going to be migrated.

After the search you will be presented with a list of applications found. You can select all, new or specific applications from this list. If there are applications that you want to migrate not in the list, select the **Other Programs** option to migrate applications not listed. Once all your choices are made click on **OK**. The Select Programs panel is illustrated in Figure 27 on page 73.

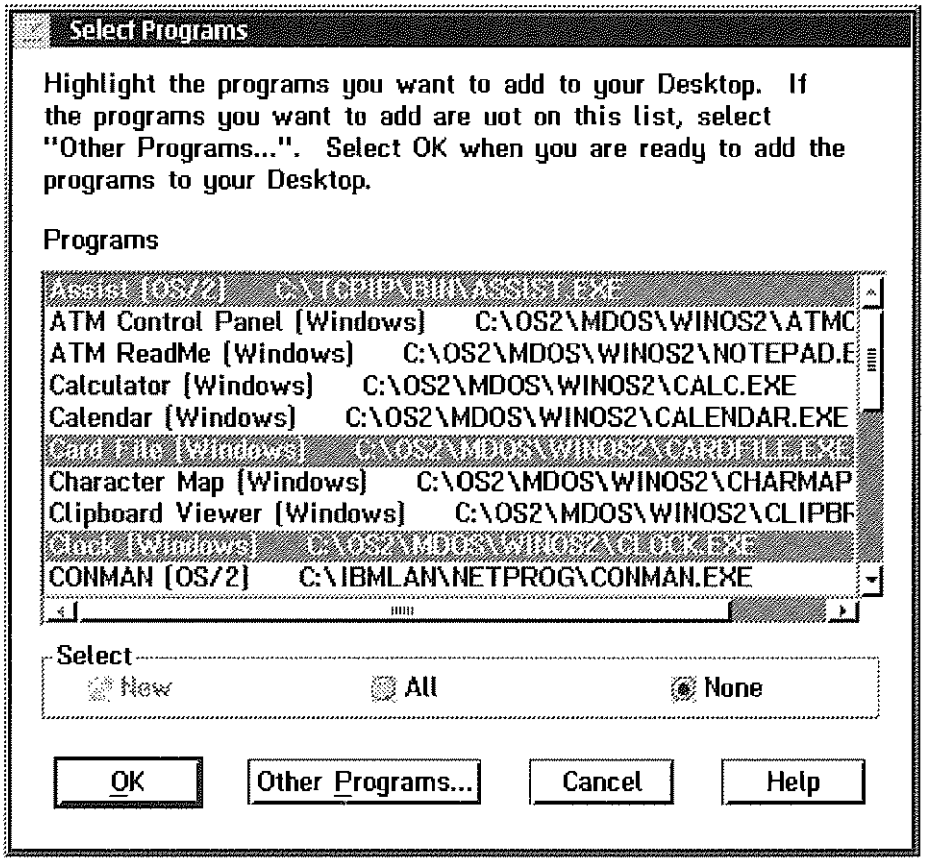

Figure 27. Select Programs

The selected applications will now be added to your desktop. In your Programs folder you will find up to four new folders:

- OS/2 Programs
- DOS Programs
- Windows Programs
- WIN-OS/2 Groups

Note

The WIN-OS/2 Groups folder will only be added if you selected to migrate Windows groups also. If you migrated programs during installation the folders could have been created at that time. This, of course, depends on the actual applications installed on your system.

2.8.3.1 How Does It Work?

The add programs or migration process makes use of a migration database file. This file is called DATABASE.TXT and is located in \OS2\INSTALL. This text version of the migration database file is compiled, and a file called DATABSE.DAT is created. The Add Programs application uses DATABSE.DAT by default. You can view the text version of the database file to see which applications will be searched for and what the settings should be in the case of a DOS or Windows application. You can add your own application and its settings to this file using a normal text editor. Use the file DBTAGS.DAT as a guide to see which commands are allowed. DBATGS.DAT is also located in \OS2\INSTALL. Finally use the PARSEDB.EXE command to recompile your edited version of DATABASE.TXT to the active DATABSE.DAT file, as follows:

```
USAGE: parsedb [path]tag_file [path]migrate_file
[[path]database_file]
```

In our example then the syntax would look like this:

```
parsedb c:\os2\install\dbtags.dat c:\os2\install\database.txt
c:\os2\install\databse.dat
```

Note

You can also create your own customized database file that will only include specific applications that you want to add. If you want to do this, use the instructions above and create your own unique migration database file.

2.9 Configuration, Installation, and Distribution (CID)

As the number of workstations in organizations have grown steadily, application software has become larger and more complex. Many applications require data or configuration information to be supplied at installation time. All of the above factors make the task of installing and maintaining workstation software within such organizations very difficult. OS/2 Warp 4 and future IBM products are being designed with the above requirements in mind. One method you can use is called Configuration, Installation and Distribution (CID).

CID is a mechanism that allow users to install target workstations easily and effectively across a local area network. The concept was designed by IBM and announced in October 1992.

A simplified explanation of CID can read as follows:

> The server system contains diskette images of the products to be installed. The client systems are connected to the server using standard network protocols. You boot the target system using bootable diskettes previously created, make a connection to the server and install the products across the network to the target system.

2.9.1 Overview and Concepts

Let us have a look at some of the concepts that will be used, and provide an overview of the CID techniques that will be discussed.

2.9.1.1 Installation Modes

The installation techniques used to install any kind of software product are classified into three modes:

Attended Installation Attended installation is defined as that requiring a knowledgeable individual to be in attendance at the workstation where the software is being installed. This individual will need to respond to the various prompts that are displayed during the installation and configuration process.

Lightly Attended Installation The phrase lightly attended installation refers to an environment where an individual must be present to initiate the installation process and potentially perform other simple or predefined tasks. However, this individual would require no specialized system knowledge.

Unattended Installation An unattended installation has no requirement for an end user or administrator to be present at the system during installation. In this instance, a CID Manager handles the initiation of the installation as well as the installation itself.

2.9.1.2 Configuration Installation and Distribution (CID)

The primary goals of CID are to:

- Eliminate human intervention at the target workstation when preparing and executing the configuration, installation, migration, and maintenance processes that are necessary to operate this workstation.
- Enable the code executing at the target workstation to perform all required configuration and installation tasks, including the integration of previous customizations
- Provide the capability to centralize human intervention to an administrator at a central preparation site.

CID allows for products, including OS/2 Warp 4 and its subsystems, to be installed using a drive other than the A: drive. The client, which is the system being installed, configured or maintained, accesses the product files through a redirected drive. This is called a redirected installation. The system that contains the source files (or installation

diskette images) to be used during the installation or maintenance process is called the Code Server. Having the files on the code server saves the user from inserting the necessary diskettes manually. The source files for each product to be installed need to be placed on the server in a predefined format and structure. In most cases, utilities will be provided with applications to transfer the files from the product diskettes to the code server's product image directory.

CID also provides the capability to install different products without the user answering all the installation questions. At the same time, it provides the customization required by the end user for different installation needs. This is done through response file support. Response files are product-specific ASCII files that contain sequences of keyword-value pairs. They are interpreted during the installation and configuration process of a product. Simply put, they are responses to installation questions that a user installing the software would normally encounter.

CID conceptually defines six criteria for a software product to be CID enabled:

- Response files
- Command-line driven execution
- Redirected drives
- Progress indication and logging facilities
- Standard return codes
- Transfer of product diskettes

With OS/2 Warp 4, there are two methods that can be used to distribute workstation software for CID and non-CID-enabled applications. They are described in the following sections.

2.9.1.3 Redirected Installation

When starting a normal software installation, a user inserts a diskette or CD-ROM into a drive and starts the installation program. The product will continue to install from the drive until all the diskettes required by the installation program have been processed or the installation ends.

A redirected installation defines the capability of the installation program to use a drive other than the diskette or CD-ROM drive, particularly the ability of the installation program to use a logical drive letter for installation.

Using this method, a workstation can access a server where the contents of the diskettes have been copied and perform the installation. This is the least complex method, but it requires the most interaction at the workstation.

Some of the ways of sharing a drive on a network are using:

- SRVIFS

- LAN Server
- NetWare Server
- TCP/IP - Network File System (NFS)

Clients that wish to use the remote drive provided by any of the services listed above would require the appropriate requester software. What follows is a brief explanation of each of the options.

SRVIFS: SRVIFS is a small NetBIOS-based file server and requester, that is shipped with OS/2 Warp 4. It is contained within the MultiProtocol Transport Services (MPTS) component. The main use of SRVIFS is to provide redirected file I/O support to enable client access to a code server. Since SRVIFS requires a relatively small amount of disk space, it is particularly suited to being used during an installation that requires a diskette boot.

LAN Server: Using the RIPL or File Services function provided with previous versions of LAN Server or OS/2 Warp Server, a network drive can be made available to client workstations.

Novell NetWare: A NetWare File Server network drive can be made available to client workstations. Client workstations will require the NetWare requester code.

TCP/IP NFS: TCP/IP provides a feature called Network File System (NFS) which can be used to share file resources across a network. Utilizing TCP/IP and NFS for redirected drive access provides a cross-systems environment. This allows different system types running operating systems other than OS/2 to take on the role of providing the remote drive. For example, the remote drive could be located on AIX, VM, MVS or OS/2. Client workstations or boot diskettes will require the appropriate requester software to connect to the remote drive.

TCP/IP NFS is not included in OS/2 Warp 4. It is available as a separate product.

2.9.1.4 CASSETUP

The Setup Utility (CASSETUP) for redirected installation is an applet that provides a Presentation Manager interface for installing and configuring a code server for redirected installation. The CASSETUP utility is contained in the MPTS component of OS/2 Warp 4. The setup utility also provides a user interface to assist administrators in creating bootable diskettes for use by clients to initialize and process redirected installation sessions.

The Setup Utility provides the following functions to assist administrators in preparing for redirected installation:

- A Presentation Manager interface for the installation and removal of redirected installation support. Redirected Installation support includes the LAN CID Utility and the Service Installable File System (SRVIFS).

- Installation and removal of diskette images
- A method of recording application diskette images that were previously loaded onto the server. This function allows you to use the utility with these images without having to reload them.
- Creation of a LAN CID Utility CASPREP and command file that will allow clients to install selected product images that were installed on the code server through the Setup Utility.
- Creating boot diskettes for use by clients to initialize and process redirected installation sessions.

2.9.2 Using a Redirected Drive

In this section, we describe different methods to obtain one or more drives from a code server by using different transport protocols and utilities.

Once you have accessed a code server through its redirected drives, you'll be able to run multiple tasks, for example:

- Get access to the code files of the product that you want to install. Usually, the product can be installed from a single directory containing all the product files (for example, most Lotus products allow installation from a single directory on a CD-ROM or a hard drive).
- Get access to customized response files for the client installation (assuming that the product to be installed accepts predefined response files as input).
- Write log files that allow error discovery and troubleshooting (if the product to be installed writes a log file as output).
- Execute some utility or application that may help us during the installation.
- Browse code server files and directories and make some changes on them.

Redirected drives have the following advantages:

- You can install an application easier and faster than using diskettes.
- Many people can install the same application at the same time.
- Configuration, installation and removal of necessary files that allow access to the code server is easy and is supported from many standard protocols.

2.9.2.1 Methods for Obtaining Redirected Drives

In this section, we briefly describe some methods based on standard transport protocols such as NetBIOS, TCP/IP and IPX, and provide some examples and implementations.

Use of SRVIFS: SRVIFS is a small application that implements a reduced NetBIOS client/server environment using OS/2 as its operating system.

We will describe step-by-step how to install and configure a server and how a client can be attached to the server resources.

1. **Determine if NetBIOS is installed in your machine**

   In most cases, NetBIOS is already configured and running in your machine because, for example, you have a LAN Requester installed on it.

   If you don't have NetBIOS installed on your client or server, you will have to install it.

   Note: In most cases, you will install the SRVIFS server on a workstation that already has NetBIOS running. If you need to distribute, for example, communication software to OS/2 workstations that were not attached to the network previously, you will need to install NetBIOS support. Another example is installing a product from scratch using boot diskettes.

   To achieve this, you have two alternatives:

   - Install the LAN Adapter and Protocol Support
   - Install THINLAPS

   In order to transfer NetBIOS and the network drivers onto the target system, the code server administrator uses a utility called THINLAPS.

   THINLAPS will install a seed LAN transport system on the target system and update the CONFIG.SYS accordingly.

   A PROTOCOL.INI is created on the target system based on a valid network information file (.NIF). The name of the .NIF is supplied as a parameter.

   To start THINLAPS, change to the directory on the OS/2 Warp 4 CD-ROM to:

   ```
   \CID\SERVER\MPTS
   ```

   Now run the THINLAPS program.

   For example, you can type:

   ```
   THINLAPS f:\cid\server\mpts e: ibmtok.nif
   ```

   Where `e:` is the drive where THINLAPS will be installed, and `f:` is the CD-ROM drive.

   Transport protocol support files are copied in the root of the drive selected for THINLAPS installation. These files are emphasized in Figure 28 on page 80.

```
The volume label in drive E is OS2.
The Volume Serial Number is A6D4:0814.
Directory of E:\

10-10-95   7:27p      <DIR>          0  .
10-10-95   7:27p      <DIR>          0  ..
 9-11-95   2:35p       3349          0  acsnetb.dll
 9-19-95  11:44a        433          0  AUTOEXEC.BAT
10-10-95   7:27p       3433         42  CONFIG.SYS
10-10-95   6:48p      <DIR>        869  Desktop
 9-19-95  11:45a       1396          0  IBMLVL.INI
 6-01-95   1:00p      17736          0  ibmtok.os2
 9-19-95  10:08a      <DIR>          0  IBMVESA
 9-11-95   2:45p       3572          0  LANMSGDD.OS2
 9-11-95   2:45p       2580          0  LANMSGDL.DLL
 9-11-95   2:45p       1099          0  LANMSGEX.EXE
 9-11-95   2:45p      12814          0  LT0.MSG
 9-11-95   2:43p       2860          0  lt2.msg
 9-19-95  10:22a      <DIR>        331  Maintenance Desktop
10-10-95   6:48p      <DIR>          0  MMOS2
 9-11-95   2:34p     114532          0  NETBEUI.OS2
 9-11-95   2:44p      13657          0  NETBIND.EXE
 9-11-95   2:35p      15892          0  NETBEUI.OS2
 9-19-95  11:45a      <DIR>          0  NETWARE
10-05-95  11:36a      <DIR>        296  Nowhere
 9-19-95  11:35a      <DIR>        296  Nowhere1
10-10-95   6:49p      <DIR>          0  OS2
 9-11-95   2:44p       2234          0  pro.msg
 9-11-95   2:44p      22276          0  PROTMAN.OS2
10-10-95   7:27p        533          0  PROTOCOL.INI
 9-19-95  10:06a      <DIR>          0  PSFONTS
 2-05-95  11:03p      26704          0  README
 9-19-95  11:34a      <DIR>          0  SPOOL
10-10-95   4:29p      <DIR>          0  SRVIFS
10-10-95   4:29p        150          0  startup.cmd
 9-19-95  10:08a      <DIR>          0  XVA$DMQS
```

Figure 28. THINLAPS. THINLAPS applied to a drive E:. Everything is copied into the root.

The THINLAPS installation adds information in the CONFIG.SYS file (see Figure 29 on page 81).

```
.
.
.
.
SET PATH= .....................;E:\SRVIFS;
SET DPATH= .....................;E:\SRVIFS;
.
.
.
.
rem *** Start of ThinLAPS additions ***
device = lanmsgdd.os2
device = protman.os2
device = netbeui.os2
device = NetBios.os2
DEVICE=IBMTOK.OS2
call = netbind.exe
run = lanmsgex.exe
rem *** End of ThinLAPS additions ***
.
.
.
```

Figure 29. THINLAPS. CONFIG.SYS is updated by THINLAPS.

It also creates a PROTOCOL.INI file on the drive selected for installation (see Figure 30).

```
[protman]
  drivername = protman$

[netbeui_nif]
  drivername = netbeui$
  bindings = mac

; If running on an ethernet network, remove the semicolon from the
; "ETHERAND_TYPE =" statement to change the protocol convention from
; IEEE 802.3 to DIX 2.0.
; ETHERAND_TYPE = "D"

[mac]
  drivername = IBMTOK$
;   EARLYRELEASE
;   ADAPTER = ""
;   NETADDRESS = ""
;   RAM = 0x
    MAXTRANSMITS = 6
    RECVBUFS = 2
    RECVBUFSIZE = 256
    XMITBUFS = 1
;   XMITBUFSIZE =
;   ENABLEBRIDGE
;   BRIDGERAM =
```

Figure 30. THINLAPS. PROTOCOL.INI is created on the root.

2. **Installing a SRVIFS Server**

You will find the necessary files for installing the SRVIFS server in the directory \CID\SRVIFS on the OS/2 Warp 4 CD. You will find the files as shown in Figure 31 on page 82.

```
The volume label in drive F is WARP.
The Volume Serial Number is C15E:0030.
Directory of F:\CID\SRVIFS

 9-18-95  12:00p     <DIR>           0  .
 9-18-95  12:00p     <DIR>           0  ..
 9-11-95   2:48p     28972           0  IFSDEL.EXE
 9-11-95   2:37p     50640           0  SERVICE.EXE
 9-11-95   2:37p     14008           0  SRVATTCH.EXE
 9-11-95   2:37p      1076           0  SRVIFS.SYS
 9-11-95   2:37p     24692           0  SRVIFSC.IFS
 8-21-95   8:22p       169           0  SYSLEVEL.SIF
 9-11-95   2:48p     32342           0  THINIFS.EXE
 9-11-95   2:48p     43268           0  THINSRV.EXE
 9-11-95   2:48p      8511           0  XI1.MSG
 9-11-95   2:48p     28894           0  XI1H.MSG
       12 file(s)     232572 bytes used
                           0 bytes free
```

Figure 31. Directory \CID\SRVIFS. All you need for installing and configuring a SRVIFS server.

3. **Configuring the SRVIFS server response file.**

   First, you need to configure a SRVIFS server response file. OS/2 Warp 4 provides a template of a SRVIFS response file that you can modify according to your need.

   In fact, by unzipping the file:

   `\CID\IMG\MPTS\UTILITY\SAMPLE\SAMPLE.ZIP`

   we obtain the files shown in Figure 32 on page 83.

```
The volume label in drive C is OS2.
The Volume Serial Number is 1F24:9195.
Directory of C:\SAMPLE

.          <DIR>     10-10-95   3:28p
..           <DIR>     10-10-95   3:28p
LAPSRSP  RSP       285   5-09-95   4:29p
LAPSRSP0 RSP       412   5-09-95   3:48p
LAPSRSP1 RSP      1028   5-09-95   3:48p
LAPSRSP2 RSP       939   5-09-95   3:48p
LAPSRSP3 RSP      1238   5-09-95   3:48p
LAPSRSP4 RSP      1617   5-09-95   3:48p
LAPSRSP5 RSP       454   5-09-95   3:48p
LAPSRSP6 RSP       903   5-09-95   3:48p
LAPSRSP7 RSP      1202   5-09-95   3:48p
LAPSRSP8 RSP       316   5-09-95   3:48p
LAPSRSP9 RSP       297   5-09-95   3:48p
MPTSRSP1 RSP      2530   5-09-95   4:29p
MPTSRSP2 RSP      1064   5-09-95   4:29p
MPTSRSP3 RSP      3070   5-09-95   4:29p
SERVICE  INI       359   5-09-95   3:50p
SERVICE  LST       431   5-09-95   3:50p
       18 file(s)      16145 bytes used
                    30912512 bytes free
```

Figure 32. SRVIFS Server. Unzipping the file \CID\IMG\MPTS\UTILITY\SAMPLE\SAMPLE.ZIP.

The file called SERVICE.INI is a sample of a response file for the SRVIFS server. The file called SERVICE.LST is a sample of the authorization list file for the SERVICE.INI file. A configured example of SERVICE.INI is shown in Figure 33. Figure 34 on page 84 is an example of SERVICE.LST.

```
;
!
@
#
Adapter       = 0
MaxClients    = 5
MaxFiles      = 102
Name          = CIDSRV
Groupname     = No
ClientWorkers = 6
Authlist      = E:\SRVIFS\SERVICE.LST
;
Path          = E:\
perclient     = No
PermitWrite   = Yes
;
alias= readonly,single,cdrom.e:\cid
alias= readwrite,single,writedsk,d:\cid\img
```

Figure 33. SRVIFS Server. Sample of SERVICE.INI.

Note: The server name (srvname) must be a unique name and can not be used by other NetBIOS applications, such as LAN Server/Requester. It may not exceed eight bytes (characters or numbers).

In the above example, the authorization list file is located in the E:\SRVIFS directory, and E:\ is the fully qualified path that will appear as the root of the redirected drive to the SRVIFS redirector.

We have configured two aliases, cid and img, corresponding to the different directories in the C drive of the code server.

```
* This is a sample authorization list file for service.ini file
* This file should have one requester name per line.  The requester
* name should be 1-8 characters long followed by at least 1 space.
* For each requester, the name may optionally be followed by a
* Universal Administered address of the LAN adapter. This optional
* feature provides an additional layer of security.
*
client1
client2
client3.10005a882805
```

Figure 34. SRVIFS Server. Sample of SERVICE.LST.

4. **Installing the SRVIFS server**

   The next step is to create a directory in the drive where the SRVIFS server is installed. We can call it, for example, SRVIFS:

   ```
   E:\SRVIFS
   ```

   Now, you need to run the THINSRV program.

   For example, type:

   ```
   THINSRV /R:e:\srvifs\service.ini /T:e:\srvifs
     /S:f:\cid\srvifs /TU:e:\ /L1:e:
   \srvifs\thinsrv.log
   ```

   After completion, the following output is displayed:

   ```
   [F:\CID\SRVIFS]thinsrv /R:E:\SRVIFS\SERVICE.INI
     /T:E:\SRVIFS /S:F:\CID\SRVIFS
     /TU:E:\ /L1:E:\SRVIFS\THINSRV.LOG
     THINSRV completed successfully.
   ```

ALIAS statements

THINSRV checks the content of SERVICE.INI, and if it finds some inconsistency, it will fail. For example, if you don't create physically on the code server the directories specified in the ALIAS statements in SERVICE.INI, THINSRV will give you the following error message:

```
[F:\CID\SRVIFS]thinsrv
      /R:E:\SRVIFS\SERVICE.INI /T:E:\SRVIFS
/S:F:\CID\SRVIFS /TU:E:\ /L1:E:\SRVIFS\THINSRV.LOG
XI10021: Invalid value for "PATH =" statement or path on "ALIAS =
" statement on line 17 in response file.
XI10021: Invalid value for "PATH =" statement or path on "ALIAS =
" statement on line 18 in response file.
XI10021: Invalid value for "PATH =" statement or path on "ALIAS =
" statement on line 19 in response file.
XI10042: THINSRV did not complete successfully.

[F:\CID\SRVIFS]
```

Once finished, THINSRV produces the following changes on the system:

a. SRVIFS is installed on directory E:\SRVIFS

b. The following line is added in the file STARTUP.CMD:

```
START E:\SRVIFS\SERVICE.EXE /INI=SERVICE
```

c. PATH and DPATH statements are updated in CONFIG.SYS

```
PATH= ....... ;E:\SRVIFS;
DPATH= ....... ;E:\SRVIFS;
```

Now, the code server is ready to be used.

After rebooting the server, SERVICE.EXE will start automatically.

Note: If you need some suggestions on how to install the remote installation tree in the code server, please see 2.9.3.1, "Setting Up a Code Server" on page 89.

5. **Installing the SRVIFS client**

The SRVIFS client can be used on:

- A machine with OS/2 already installed that needs to be connected to the SRVIFS code server
- An OS/2 boot diskette that's needed to install OS/2 Warp 4, or other application that requires installation from boot

The same considerations for protocol support are valid for the SRVIFS client.

If you need to create OS/2 boot diskettes, you will need to use the SEDISK utility.

SEDISK is located in the directory \CID\EXE\OS2 on the OS/2 Warp 4 CD-ROM. SEDISK also needs to access the OS/2 installation tree on the OS/2 Warp 4 CD-ROM. You can find this tree in the \OS2IMAGE directory.

From the \CID\EXE\OS2 directory, execute the following command:

```
SEDISK  /S:f:\os2image /T:a:
```

You will receive the following output:

```
Insert a formatted diskette into drive A:.
Press <Enter> to continue.
All data on the diskette will be erased.
Do you want to continue? (Y/N)
Deleting all files on A:, please wait.
Copying files, please wait.

Insert a formatted diskette into drive A:.
Press <Enter> to continue.
All data on the diskette will be erased.
Do you want to continue? (Y/N)
Deleting all files on A:, please wait.
Copying files, please wait.
F:\OS2IMAGE\DISK_4\BUNDLE
- A:\REFPART.SYS
       0 file(s) copied.
       1 file(s) unpacked.

SEDISK has completed successfully.
```

6. **Attachment to the code server using THINIFS**

   THINIFS is a utility that transfers the SRVIFS redirector code to the target system (another machine or a boot diskette).

   THINIFS is located in the directory \CID\SRVIFS of the OS/2 Warp 4 CD-ROM (see Figure 31 on page 82).

   Since you don't have the CD-ROM drive attached to the target machine (the CD-ROM is attached on the code server), you cannot install the LCU redirector on the target machine using the network.

   If you need to install the LCU redirector in the hard disk of the target machine, you must:

   a. At the code server, run THINIFS and configure the OS/2 boot diskette, disk 1,

      OR

   b. Apply the modifications that THINIFS performed to the OS/2 boot diskette, disk 1, to the hard disk of the target system, also copying the LCU redirector files.

   If you don't need to configure the attachment from the target machine's hard disk, you can skip step 2.

Change to the \CID\SRVIFS directory, and run the following command:

```
THINIFS  /S:f:\cid\srvifs /T:a: /SRV:\\CODESRV\cid
         /REQ:client1 /O:x:
```

where the SRV keyword specifies the UNC (Universal Naming Convention) of the resource you need to configure for attachment, the REQ keyword specifies the name of the client (see Figure 34 on page 84) for security verification, and the /D keyword indicates the logical drive to be attached by this resource.

Attention: THINIFS needs THINLAPS

If you haven't previously installed THINLAPS, you will get the following error:

```
[F:\CID\SRVIFS]thinifs /s:f:\cid\srvifs
/t:a: /srv:\\COOESRV\cid /req:cli
ent1 /d:x:
XI10012: NetBIOS not configured in CONFIG.SYS.
XI10042: THINIFS did not complete successfully.

[F:\CID\SRVIFS]
```

Once THINIFS has completed, your OS/2 boot diskette, disk 1, will have the following new files:

```
The volume label in drive A is DISK 1.
Directory of A:\

.
.
.
.
SRVATTCH EXE    14008   9-11-95   2:37p
SRVIFS   SYS     1076   9-11-95   2:37p
SRVIFSC  IFS    24692   9-11-95   2:37p
.
.
.
.
      68 file(s)    1232093 bytes used
                     209920 bytes free
```

Figure 35. THINIFS. OS/2 boot diskette, disk 1, added files.

The CONFIG.SYS will have the following information:

```
.
.
.
.
rem *** Start of ThinLAPS additions ***
device = lanmsgdd.os2
device = protman.os2
device = netbeui.os2
device = NetBIOS.os2
device = IBMTOK.OS2
call = netbind.exe
run = lanmsgex.exe
rem *** End of ThinLAPS additions ***
.
.
.
.
DEVICE=a:\SRVIFS.SYS
IFS=a:\SRVIFSC.IFS client1
CALL=a:\SRVATTCH.EXE x: \\CODESRV\cid
.
.
.
.
```

Figure 36. THINIFS. OS/2 boot diskette, disk 1. Changes in CONFIG.SYS.

Note:

a. THINIFS can be executed several times, one time for every redirected drive you need to get from the code server.

b. The OS/2 boot diskette, disk 1, is the second of the OS/2 booting diskettes. The first one is called OS/2 Boot Installation Diskette and is not modified by THINIFS.

Finally, if you need to install the LCU redirector in a Target machine with OS/2 installed, you need to copy the files added by THINLAPS and THINIFS to the diskette along with the information in CONFIG.SYS.

2.9.3 Using CASSETUP

CASSETUP is a PM-based utility that automates several CID functions.

In this section we will describe how to configure a code server and build LCU boot diskettes using CASSETUP.

At the same time, we will explain how to use CASSETUP and the existing OS/2 Warp 4 CD-ROM CID configuration to install the products contained on the CD-ROM.

2.9.3.1 Setting Up a Code Server

One of the most important things a LAN administrator must do when setting up a code server is to decide on the directory structure. In the following section we will look at a sample directory structure in detail.

Code Server Directory Structure

Directory Structure

Before you implement your Software Distribution environment you must first consider what type of directory structure you want on the code server.

The directory structure determines where the product images and other files that are needed for remote installation are located so that the LAN CID Utility, CASSETUP, or NetView DM/2 can find them.

In the example shown in Figure 37 on page 90, the directory structure can be used by NetView DM/2, CASSETUP and LCU.

In this book, we assume that you plan to follow the recommended directory structure. If you have created, or if want to create, a directory structure other than the recommended directory structure, insert your own directory names whenever necessary.

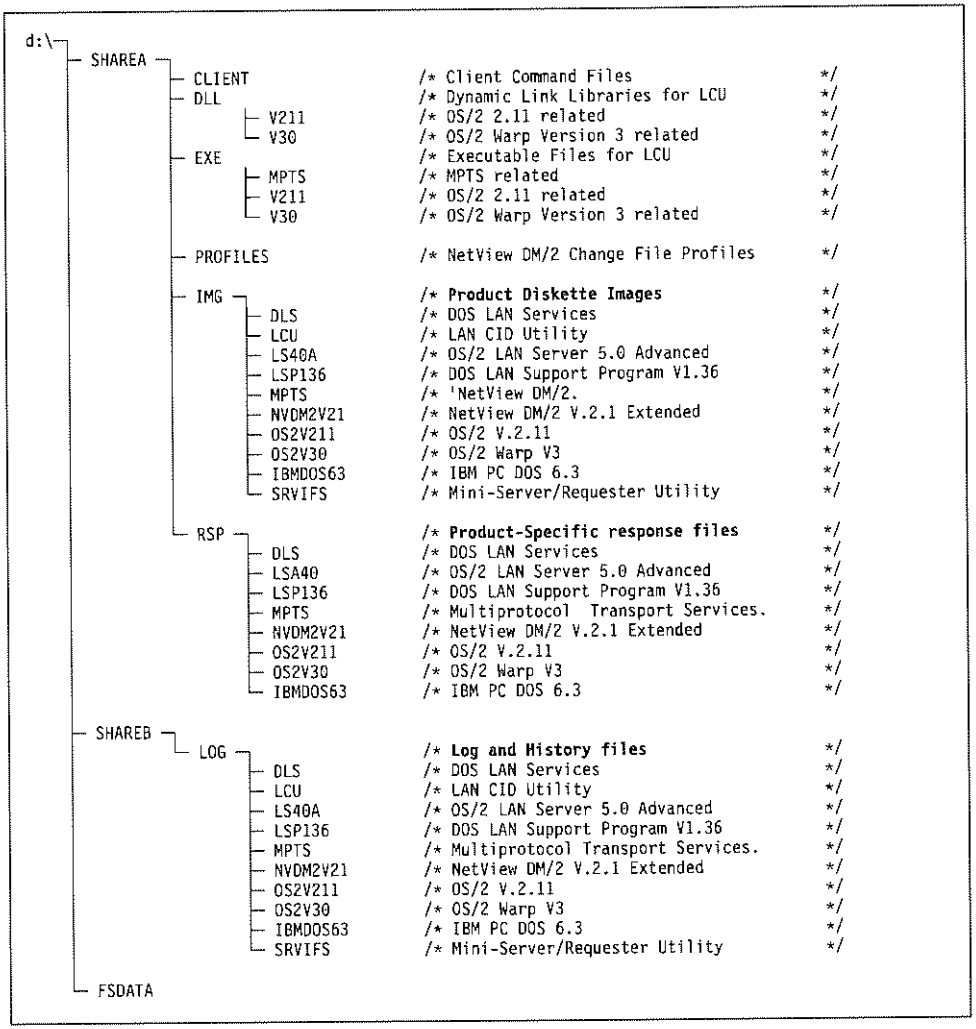

Figure 37. Code Server Directory Structure Example

Drive letter d:

In figures, examples and syntax diagrams that are shown in this chapter, the drive letter d: (always written in lowercase) is the code server's drive letter.

The following is a description of the directories found in the recommended directory structure and the intended contents of the directories.

Table 1. Description of the Recommended Directory Structure	
Directory Name	**Description**
SHAREA	The user-defined name of the root directory for all but the log directories in the recommended structure.
SHAREB	The user-defined name of the root directory for the log directory in the recommended structure.
CLIENT	The client directory containing the command files that LAN CID Utility is to use for the redirected installations on the clients. These can be specific client command files, default command files, or both.
DLL	CASSETUP and LAN CID Utility need additional OS/2- and REXX-related dynamic link libraries in order to work properly. For each OS/2 version, there is another subdirectory to this path and directory.
EXE	CASSETUP and LAN CID Utility need additional OS/2 and REXX executable files in order to work properly. For each OS/2 version, there is another subdirectory to this path and directory.
PROFILES	Change file profiles for NetView DM/2. These are product-specific files that contain the syntax of the remote installation program and are needed to build a CDM software catalog.
FSDATA	File services for NetView DM/2. These are the product-specific change files.
IMG	The product images directory containing a subdirectory for each product.
RSP	The response files directory containing a subdirectory for each product. The individual product subdirectories hold the general response files, the individual client response files and the default response files for that product. Not all programs use response files. For example, the LAN CID Utility installation program, CASINSTL, and the SRVIFS requester installation program, THINIFS, do not.
LOG	The log directory containing a subdirectory for each product.

Setting Up a Code Server with the CASSETUP Utility: CASSETUP provides a single graphical interface for several common tasks involved in installing CID-enabled products over the network.

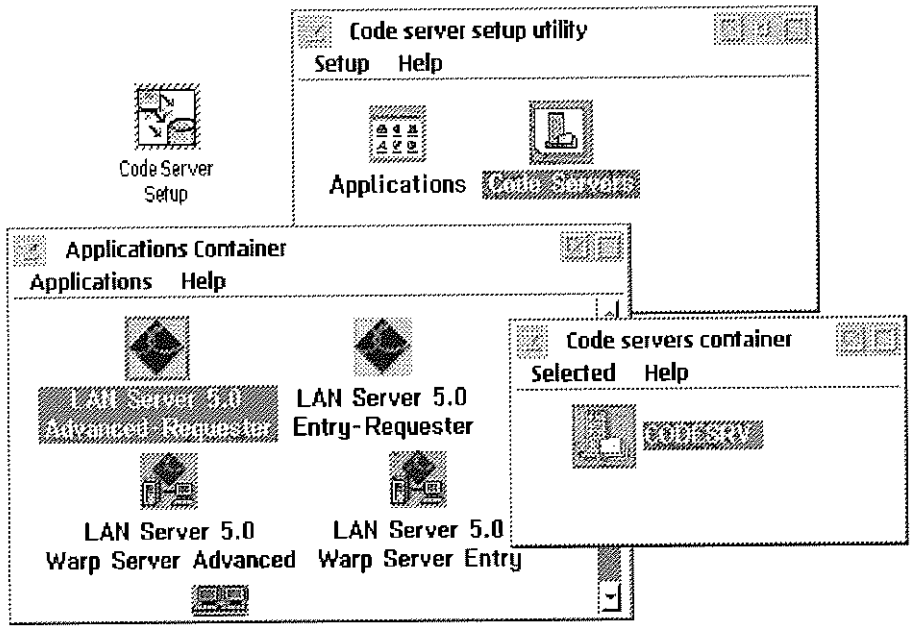

Figure 38. CASSETUP Code Server Setup Utility

CASSETUP allows you to:

- Install the redirection mechanism, SRVIFS (a simple server)
- Run the LAN CID Utility (LCU)
- Load product diskette images from diskettes or CD-ROM onto a code server
- Build LCU boot diskettes for diskette-initiated clients
- Create CASPREP files which can be used to generate the client-specific LCU command files

CASSETUP can generally handle all kinds of CID-enabled applications. To add an application to the suite that CASSETUP understands, you just add an application profile (.PRO file) to the CASSETUP directory. As described in the following pages, the CASSETUP directory in our following example is D:\CASSETUP.

Similarly, to build boot diskettes of different OS/2 versions, you just create a diskette-built script (.SCR) file by using the provided script files as templates.

Installation of CASSETUP Utility: Before you proceed with the next steps, make sure you have created the recommended directory structure discussed in "Code Server Directory Structure" on page 89.

1. Create a directory, for example, D:\CASSETUP.
2. Unzip the CASSETUP.ZIP file from the OS/2 Warp 4 CD-ROM using the following command:

   ```
   PKUNZIP2
   F:\CID\SERVER\IBMLS\IBM500N5\APPLETS\CASSETUP.ZIP
         D:\CA SSETUP
   ```

3. Generally, two modifications to CASSETUP files should be made.
   a. First, change a REXX statement in the CASENG3.CMD file. Using an ASCII editor, like EPM, go to line 627, and change the following statement:

      ```
      logpath = lcudrive
      ```

      to:

      ```
      logpath = logdrive
      ```

      Unless you make this change, all clients being remotely installed will have read/write access to the product image tree.

   b. Second, make the following changes to the CASENG6.CMD file. Load this file using an ASCII editor, and go to line 1003. Look for the following section:

```
TheCmd = TheCmd || '/l1:'glob.lcualias.0Drive':\'
IF glob.lcupath <> "" THEN
TheCmd = TheCmd || STRIP(glob.lcupath,'b','\') || "\"
TheCmd = TheCmd || 'LOG\lcu\"client".log '
TheCmd = TheCmd || '/l2:'glob.lcualias.0Drive':\'
IF glob.lcupath <> "" THEN
TheCmd = TheCmd || STRIP(glob.lcupath,'b','\') || "\"
TheCmd = TheCmd || 'LOG\lcu\srvifs_req.log '
TheCmd = TheCmd || '/req:"client"'
```

and make the highlighted changes to this section:

```
TheCmd = TheCmd || '/l1:'glob.logalias.0Drive':\'
IF glob.lcupath <> "" THEN
TheCmd = TheCmd || STRIP(glob.lcupath,'b','\') || "\"
TheCmd = TheCmd || 'LOG\lcu\"client".log '
TheCmd = TheCmd || '/l2:'glob.logalias.0Drive':\'
IF glob.lcupath <> "" THEN
TheCmd = TheCmd || STRIP(glob.lcupath,'b','\') || "\"
TheCmd = TheCmd || 'LOG\lcu\srvifs_req.log '
TheCmd = TheCmd || '/req:"client"'
```

Unless you make this change, logfiles cannot be written to disk since the lcudrive is a read/only area, whereas the logdrive is not.

4. From the D:\CASSETUP directory, issue the following installation command from an OS/2 command line:

   ```
   CASINST
   ```

   A Code Server Setup icon will appear on your desktop when the installation of CASSETUP is complete.

   The following screen will be displayed:

Code server setup

```
------------------------------------------------------------------
          Date: 19 September 1996      Time: 14:13:48
               Code Server Utility Installation
------------------------------------------------------------------
--- Establishing Execution profile
--- Creating Workplace shell object
    Code Server Setup WorkPlace object created
------------------------------------------------------------------
code server installation ended
Updating config.sys...
        1 file(s) copied.
        1 file(s) copied.
Your original config.sys was backed up in file D:\config.477
Your config.sys has been updated.  Reboot before running CASSETUP.
```

5. Shut down and reboot your workstation as prompted.

Modify CASSETUP.STR Storage Information File: Before you actually load the CASSETUP Code Server Setup utility, we recommend that you adapt the storage information file, CASSETUP.STR, to your CID environment. Alternatively, you may use the application features of CASSETUP to modify default values.

Change to the d:\CASSETUP directory, and edit the file CASSETUP.STR by using an ASCII editor, such as EPM.

Selecting Application Profiles: The Code Server utility comes with a series of application profile (.PRO) files which are installed by the `CASINST` command.

These are examples of application profiles for different CID-enabled products:

```
LS40A.PRO          DS/2 LAN Server 4.0 Advanced  (whole product)
LS40E.PRO          OS/2 LAN Server 4.0 Entry     (whole product)
LS40AREQ.PRO       OS/2 LAN Server 4.0 Advanced  (Requester part)
LS40AREQ.PRO       OS/2 LAN Server 4.0 Entry     (Requester part)
LS40CDA.PRO        OS/2 LAN Server 4.0 Advanced  (from CD)
LS40COE.PRO        OS/2 LAN Server 4.0 Entry     (from CD)
MPTS10.PRO         Multiple Protocol Transport Services
MPTS10CD.PRO       Multiple Protocol Transport Services from CD
OS221.PRO          OS/2 2.1
```

```
OS2211.PRO          OS/2 2.11
OS221SP.PRO         OS/2 2.1 Service Pak XR06200
OS2F30.PRO          OS/2 Warp Version 3.0 (Full version)
OS2F30CD.PRO        OS/2 Warp Version 3.0 (Full version from CD)
OS2W30.PRO          OS/2 Warp Version 3.0 (For Windows version)
OS2W30CO.PRO        OS/2 Warp Version 3.0 (For Windows version from CO)
```

The following profiles appear in the D:\CASSETUP directory after they are unzipped from the CASSETUP.ZIP file contained in the OS/2 Warp 4 CD-ROM:

```
LS50AREQ.PRO        LAN Server 5.0 Advanced Requester
LS50EREQ.PRO        LAN Server 5.0 Entry    Requester
LS50WSA.PRO         LAN Server 5.0 Advanced Server
LS50WSE.PRO         LAN Server 5.0 Entry    Server
MPTS50WS.PRO        Multiple Protocol Transport Services 5.0
OS2WS.PRO           OS/2 Warp 3.0 (Full version from CD)
```

2.9.3.2 Creating Additional Application Profiles or Modifying the Existing Ones

If you want to distribute OS/2 Warp, you can easily modify its application profile by doing the following:

1. In the \CASSETUP directory, copy the template file OS2WS.PRO to OS2WS.000.
2. Edit the OS2WS.PRO file, and change the following values as emphasized in Figure 39 on page 96.

```
* CASSETUP application profile for: OS/2 Warp 3.0 (WIN-OS2 version)
*****************************************************************
*          APPLICATION DESCRIPTION SECTION                      *
*****************************************************************
APPNAME = OS/2 Warp Server with WIN-OS/2 - CD-ROM
APPNICK = OS2F305
PROGTYPE = 1
ICON = CASSETUP:#111
OS = 1
PACKAGE = 1
* FIXTO =
* FIXLEVEL =
LOADPREREQS = <LCU>
*****************************************************************
*                    IMAGE LOAD SECTION                         *
* (elements in this section describe how the application's      *
* install image is put onto a code server -- usually by being   *
* copied from install diskettes or CD-ROM)                      *
*****************************************************************
APPDIR =OS2IMAGE
WORKDIR = EXE\OS2F305
DLLDIR = DLL\OS2F305
RESPDIR = RSP\OS2F305
LOGDIR = LOG\OS2F305
METHOD =  2
NUMDSKT = 1
IMAGELOAD.0 = 0
IMAGELOAD.1 = XCOPY $S\OS2IMAGE $T /s /e /v /h /o /t /r
IMAGELOAD.2 = GetOSCID $T $W
IMAGELOAD.3 = GetRExx $T $D
IMAGELOAD.4 = GetBoot $T $W
SETUP.0 = 1
SETUP.1 =  OS/2 Warp Server 3.05 CD-ROM
SETUP.1.0MarkerFile = OS2IMAGE\DISK_0\OS2KRNLI
SETUP.1.0 =     0
*****************************************************************
*                       INSTALL SECTION                         *
* (elements in this section deal with how the application is    *
* remotely installed).                                          *
*****************************************************************
INSTCMD = $W\seinst /b:$B /s:$S /t:$T /l1:$L\"client".log /r:
DEFRESPFILE = default.rsp
MaintSysReq = 1
*****************************************************************
*              MAINTENANCE SYSTEM SECTION                       *
* (applications that have a PROGTYPE of 1 (OS), 2 (transport)   *
* or 3 (redirector) have associated commands that allow them    *
* to be installed as part of Maintnance Systems.  This section *
* describes those commands.                                     *
*****************************************************************
MSCmd.0 = 2
MSCmd.1 = $W\semaint /s:$S /t:$M /b:$B /l1:$L\"client".log
MSCmd.1.0CmdName = semaint
MSCmd.2 = $W\sedisk /S:$S /T:$T
MSCMD.2.0CmdName = sedisk
MaintSysBuild = 1
```

Figure 39. CASSETUP Profile for OS/2 Warp Version 3 (OS230.PRO)

You need to specify the directory for the OS/2 Warp Image files in:

APPOIR =**OS2IMAGE**

And specify that you don't need to download the images of the product into the code server, with:

IMAGELOAO.0 = 0

Figure 40 shows the CASSETUP profile file for MPTS 5.0. You will also find the changes to do this emphasized.

```
*****************************************************************
*          APPLICATION DESCRIPTION SECTION                      *
*****************************************************************
APPNAME = Multi-Protocol TransportēServices 5.0 from Warp Server
APPNICK = mpts50
PROGTYPE = 2
ICON = CASSETUP:#107
OS = 1
PACKAGE = 1
* FIXTO =
* FIXLEVEL =
*****************************************************************
*                  IMAGE LOAD SECTION                           *
* (elements in this section describe how the application's      *
* install image is put onto a code server -- usually by being   *
* copied from install diskettes or CD-ROM)                      *
*****************************************************************
APPDIR = MPTS
WORKDIR = EXE\mpts50
DLLDIR = DLL\mpts50
RESPOIR = RSP\mpts50
LOGDIR = LOG\mpts50
METHOD =  2
NUMDSKT = 1
IMAGELOAD.0 = 0
g fixed.
IMAGELOAD.1 = XCOPY $S\CID\SERVER\MPTS $T /s
SETUP.0 = 1
SETUP.1 =  MPTS 5.0 WARP SERVER CD-ROM
SETUP.1.0MarkerFile = CID\SERVER\MPTS\MPTS.EXE
* SETUP.1.1Volser = WARP SERVER
SETUP.1.0 =     0
*****************************************************************
*                      INSTALL SECTION                          *
* (elements in this section deal with how the application is    *
* remotely installed).                                          *
*****************************************************************
INSTCMD = $S\mpts /e:prod /s:$S /t:$B /l1:$L\"client".log /r:
INSTCMDM = $S\mpts /e:maint /s:$S /t:$B /l1:$L\"client".log /r:
DEFRESPFILE = default.rsp
MaintSysReq = 0
*****************************************************************
*             MAINTENANCE SYSTEM SECTION                        *
* (applications that have a PROGTYPE of 1 (OS), 2 (transport)   *
* or 3 (redirector) have associated commands that allow them    *
* to be installed as part of Maintnance Systems.  This section  *
* describes those commands.                                     *
*****************************************************************
MSCmd.0 = 2
MSCmd.1 = $S\mpts /e:prep /s:$S /t:$M /tu:$B /l1:$L\"client".log /r:
MSCmd.1.0DefRespFile = default.rsp
MSCmd.1.0CmdName = mpts_prep
MSCmd.2 = $S\thinlaps . $T $N
MaintSysBuild = 1
```

Figure 40. CASSETUP Profile for MPTS 5.0 (MPTS50WS.PRO)

You need to specify a directory for the Multiple Protocol Transport Services 5.0 image files in:

```
APPDIR = MPTS
```

And specify that you don't need to download the images of the product into the code server, with:

```
IMAGELOAD.0 = 0
```

Now, suppose that we need to distribute an application that doesn't have a template in the D:\CASSETUP directory. Use a similar application as a model and modify it for the new application.

The following example illustrates how to generate a profile file for SystemView in Warp Server. We took the profile file OS/2 Warp V3.0 as a template and we typed:

```
COPY OS2WS.PRO SYSVIEW2.PRO
```

Please see Figure 41 on page 99. In this figure, all changes we have made are emphasized.

```
* CASSETUP application profile for: OS/2 Warp 3.0 (WIN-OS2 version)
*****************************************************************
*          APPLICATION DESCRIPTION SECTION                      *
*****************************************************************
APPNAME = SystemView in Warp Server Manager
APPNICK = SYSVIEW2
PROGTYPE = 4
ICON = CASSETUP:#111
OS = 1
PACKAGE = 1
* FIXTO =
* FIXLEVEL =
LOADPREREQS = <LCU>
*****************************************************************
*                   IMAGE LOAD SECTION                          *
* (elements in this section describe how the application's      *
* install image is put onto a code server -- usually by being   *
* copied from install diskettes or CD-ROM)                      *
*****************************************************************
APPDIR =SYSVIEW2\SERVER_2
WORKDIR = EXE\SYSVIEW2
DLLDIR = DLL\SYSVIEW2
RESPDIR = RSP\SYSVIEW2
LOGDIR = LOG\SYSVIEW2
METHOD =  2
NUMDSKT = 1
IMAGELOAD.0 = 0
IMAGELOAD.1 = XCOPY $S\OS2IMAGE $T /s /e /v /h /o /t /r
IMAGELOAD.2 = GetOSCID $T $W
IMAGELOAD.3 = GetRExx $T $D
IMAGELOAD.4 = GetBoot $T $W
SETUP.0 = 1
SETUP.1 =  OS/2 Warp Server 3.05 CD-ROM
SETUP.1.0MarkerFile = OS2IMAGE\OISK_0\OS2KRNLI
SETUP.1.0 =     0
*****************************************************************
*                     INSTALL SECTION                           *
* (elements in this section deal with how the application is    *
* remotely installed).                                          *
*****************************************************************
INSTCMD = $S\svinst /X /A:I /S:$S /T:$T /l1:$L\$C.l1 /l2:$L\$C.l2 /l3:$L\$C.l3 /r:
DEFRESPFILE = default.rsp
MaintSysReq = 0
*****************************************************************
*             MAINTENANCE SYSTEM SECTION                        *
* (applications that have a PROGTYPE of 1 (OS), 2 (transport)   *
* or 3 (redirector) have associated commands that allow them    *
* to be installed as part of Maintnance Systems.  This section  *
* describes those commands.                                     *
*****************************************************************
MSCmd.0 = 2
MSCmd.1 = $W\semaint /s:$S /t:$M /b:$B /l1:$L\"client".log
MSCmd.1.0CmdName = semaint
MSCmd.2 = $W\sedisk /S:$S /T:$T
MSCMD.2.0CmdName = sedisk
MaintSysBuild = 1
```

Figure 41. CASSETUP Profile for SystemView in Warp Server Manager (SYSVIEW2.PRO)

SVINST /X is the command for SystemView in Warp Server remote installation. We have specified the keyword:

```
INSTCMD = $S\svinst /X /A:I /S:$S /T:$T /l1:$L\$C.l1 /l2:$L\$C.l2 /l3:$L\$C.l3 /r:
```

in the profile file, where $S, $T, $L, $C are replaced for, respectively, the source, the target, the log, and the client directories.

Remote Installation

In *SystemView for OS/2 Version 1 Release 1*, SH19-4184,, you will find a detailed description of the keywords for SystemView in Warp Server `SVINST` command for remote installation.

You have to set the keyword `MaintSysReq` to 0 because the system doesn't require maintenance service.

You need to specify the directory for the SystemView in Warp Server Manager Image files in:

```
APPDIR = SYSVIEW2\SERVER_2
```

And specify that you don't need to download the images of the product into the code server, with:

```
IMAGELOAD.0 = 0
```

2.9.3.3 Creating Additional Boot Diskette Script Files

In order to create a set of OS/2 Warp Version 3 boot diskettes, you need to add the following boot diskette script file:

1. In the \CASSETUP directory, copy the file 30WMPTS.SCR to 30MPTSWS.SCR.
2. Edit the 30MPTSWS.SCR file, and change values as shown in Figure 42 on page 101.

```
Title: OS/2 Warp Server and MPTS 5.0
Desc:
Build boot diskettes with OS/2 Warp Server and MPTS 5.0
EndDesc:
   * This is a comment line
   * The next line causes a prompt for a diskette to be
   * issued:
*Prompt: Programs Diskette #1
   * This next line allows us to put up a warning message if needed
*Warn: If the version of OS/2 running on this code server is 2.2 or higher, Boot Diskette
creation will probably fail. Press OK to continue.
   * The next line does a verify step. If it fails, the
   * previous line is executed again. You can choose to
   * verify either the volume label or a file or no files
   * by the arguments VOLSER label, FILE filename, or
   * BLANK
*Verify: FILE anyfile.txt
   * The next lines executes  steps:
OS: 2 os2f305
TRANSPORT: 2 mpts50 $N=NIFFILESPEC
   * lines of this sort have a type followed by a colon,
   * then an integer then a label.  The label is the
   * nickname of an application loaded on the code server
   * using CASSETUP.  The integer is the
   * ordinal of the maintenance-system building command
   * in the profile. The rest of the line defines
   * symbolic substitutions.  The left side is the string
   * to be replaced on the command line; the right is
   * the name of an environment variable that contains
   * the data to be substituted.
```

Figure 42. Create Boot Diskette Profile for OS/2 Warp Version 3 (30WMPTS.SCR)

DOS Remote IPL

Using CASSETUP, you cannot remotely install LS 5.0 with the DOS Remote IPL feature. This is due to CASSETUP's own transfer procedure. It does not use the LANINST command of OS/2 LAN Server 5.0 to transfer product diskettes for remote installation. Therefore, you cannot get prompted for any DOS version to be supported with OS/2 LAN Server 5.0.

Working with the CASSETUP Utility: Prior to starting the CASSETUP utility, you have to enable your code server for remote installation. That means you have to have MPTS loaded on your code server and configured with the NetBIOS network protocol.

Start the CASSETUP utility by double-clicking on the **Code Server Setup** icon. While loading, it reads profile and storage information you adapted, selected, and added in the steps before. From the code server Setup utility folder, open the **Applications** and **Code Servers** objects.

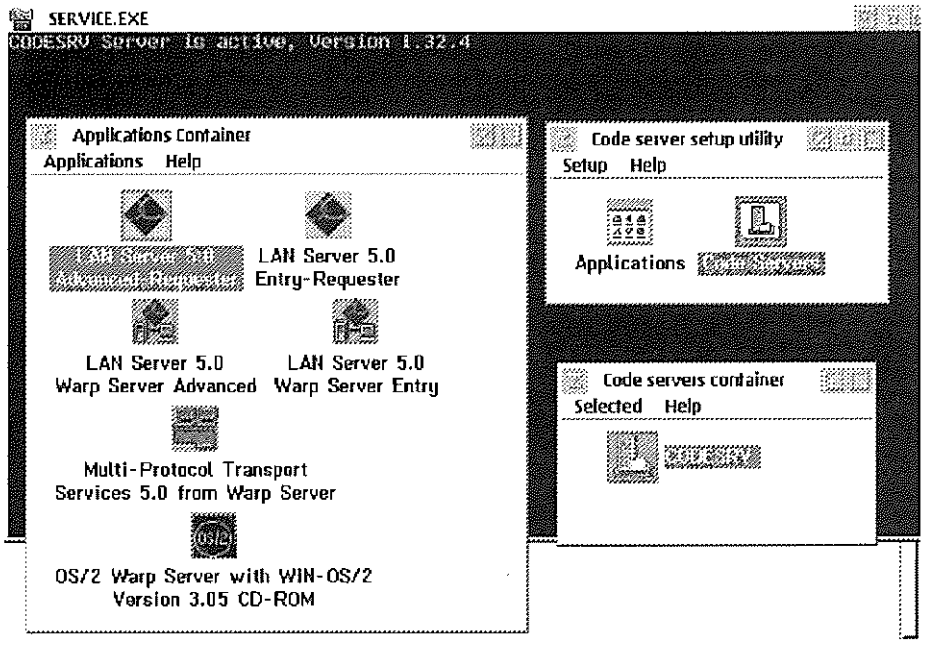

Figure 43. CASSETUP Containers

1. Load LAN CID Utility and SRVIFS.

   a. Within the code server container, click on **Selected**.

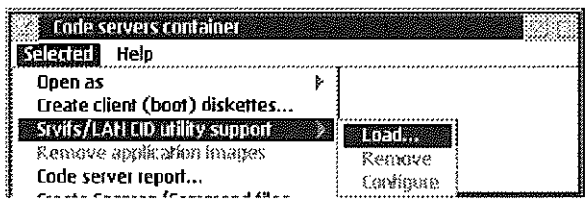

Figure 44. Code Servers Container Selected Menu

   b. Select **Srvifs/LAN CID utility support**.

   c. Then select **Load...**.

      The Load Srvifs/LAN CID utility support window will be opened. This window is shown in Figure 45 on page 103.

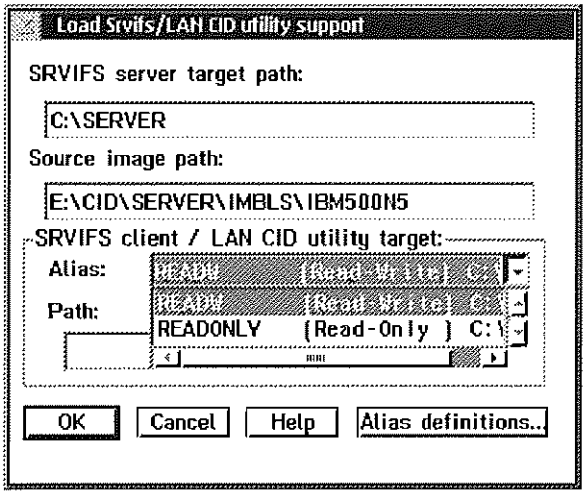

Figure 45. Load Srvifs/LAN CID Utility Support Window of CASSETUP

d. Click the **OK** button to start the installation process (you do not need to insert a path since the IMAGES alias already points to the correct directory).

   LAN CID Utility and SRVIFS are being installed on the code server. After successful completion, an information window will pop up on your screen to prompt you to stop the code server utility and to restart the workstation.

   According to the changes made to the CASSETUP.STR file, the following initialization SERVICE.INI file was created for SRVIFS:

```
Name = CODESRV
GroupName = no
Adapter = 0
MaxClients = 5
MaxFiles = 100
ClientWorkers = 10
Path = D:\SHAREA
PermitWrite = no
PerClient = no
ALIAS=READWRITE,SINGLE,LOGFILES,D:\SHAREB
ALIAS=READONLY,SINGLE,IMAGES,F:\
ALIAS=READONLY,SINGLE,IMAGES1,F:\CID\SERVER
ALIAS=READONLY,SINGLE,IMAGES2,F:\CID\CLIENT
ALIAS=READONLY,SINGLE,IMAGES3,D:\SHAREA
ALIAS=READWRITE,SINGLE,OTHFILES,D:\SHAREA
```

   After restarting the workstation, the SRVIFS server will be started from the STARTUP.CMD file.

Note: If you want to change a parameter in CASSETUP.STR after the SRVIFS/LAN CID utility support was installed, you need to select **Configure** from the Selected pull-down menu (see Figure 44 on page 102). This will update SERVICE.INI accordingly.

2. Upload and register the products.

   a. From the applications window (suite), drag the desired product object you want to make available for remote installation to the Code Server icon in the Code Server window (suite). For example, drag the OS/2 Warp Version 3 object, and drop it to the server's object, CODESRV.

      The Application Image Load window will be opened as shown in Figure 46.

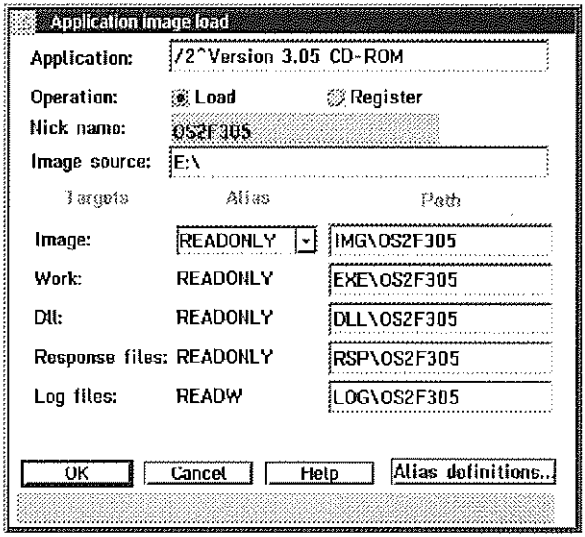

Figure 46. Application Image Load Window of CASSETUP

Figure 47 on page 105 shows the Application Image Load window for MPTS 5.0.

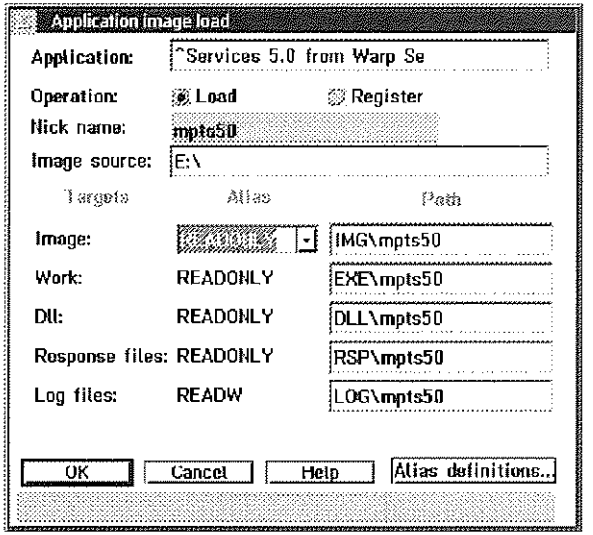

Figure 47. Application Image Load Window of CASSETUP

The Operation attribute allows you to select between **Load** and **Register**. Select:

- **Load** - When you want to upload the product diskette images to the code server's directory (in this case, select this option).
- **Register** - When you only want to register the product since the product has already been uploaded (that means the CID Tree with the product images must have been created before with the CASSETUP utility).

All entries are retrieved from the (.PRO) profile files and the CASSETUP.STR file you adapted in the steps before. Therefore, you do not need to change the field's values.

Select **OK** to start the operation, and insert diskettes as prompted.

3. Follow the same procedure for all other products that are available in the applications window (suite) created from products contained in the OS/2 Warp 4 CD-ROM and additional products installed in the code server hard disk.
4. You may now check to see if all applications uploaded in the steps before are available at the code server's tree by expanding the tree of code server CODESRV.
5. To create client boot diskettes for pristine installations, perform the following steps:
   a. Open **Code Servers**.
   b. Click on **Selected** (see Figure 44 on page 102).
   c. Select **Create client (boot) diskettes...**.

The Create Client (Boot) Diskettes window will be opened (which is shown in Figure 48 on page 106).

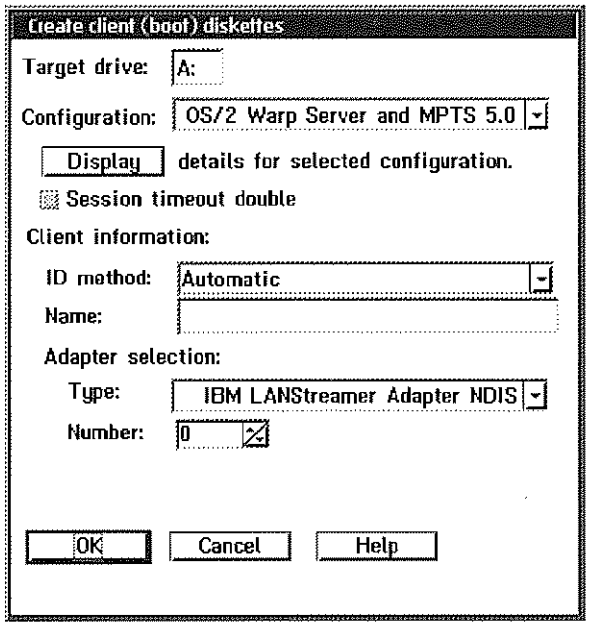

Figure 48. Create Client (Boot) Diskettes Window of CASSETUP

d. Select the correct configuration, ID method, and adapter type from the pull-down menus. If you select **Prompt** as the ID method, the IPLed client will prompt for the client's name. Otherwise, select **Client**, and enter the client's name. When all selections are made, select the **OK** button. The Boot Diskette Creation utility prompts you for diskettes. While creating the boot diskettes, the following steps will be done without user interaction:

- Creation of the OS/2 boot diskettes
- Installation of Multiple Protocol Transport Services-LAN Adapter and Protocol Support
- Installation of the mini-SRVIFS requester
- Installation of LAN CID Utility

After successful completion of the client boot diskette, select **Cancel** to close the window.

6. To create client-specific LAN CID Utility command files for remote installation, click on **Code Servers**, then Selected (see Figure 44 on page 102) and select **Create**

Casprep/Command files.... The LAN CID Utility casprep/command files window will be opened (as shown in Figure 49 on page 107):

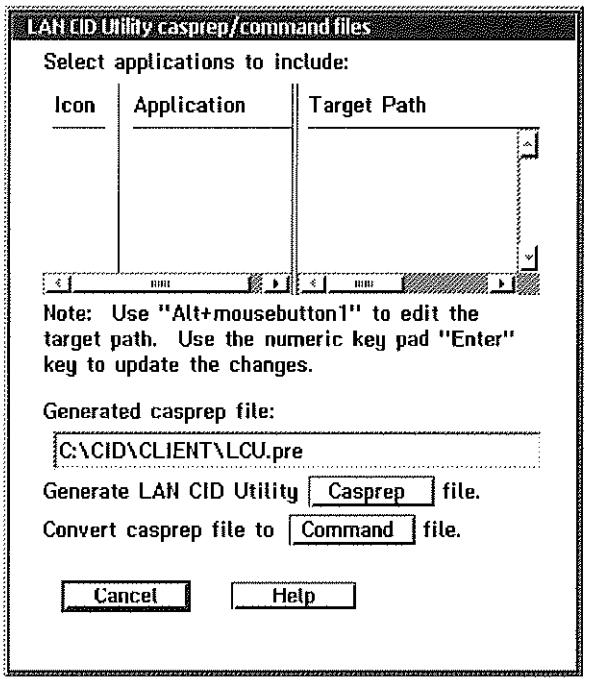

Figure 49. LAN CID Utility Casprep/Command Files Window of CASSETUP

a. Select the applications you want to install remotely.

b. Change the target path, if necessary. To edit the target path, use Alt+left mouse button sequence. The path gets updated when you press the numeric Enter key (which is the Enter key on the numeric keypad).

c. Select **Generate LAN CID Utility Casprep file**.

   This procedure invokes the generation of a LAN CID Utility Casprep file that can be converted to the LAN CID Utility client command file. If OS/2 is selected as an application to be installed remotely, an additional dialog window will be displayed to provide information for the process to create a maintenance system. A maintenance system is needed, for example, for applications that are going to be installed remotely, but do not need, or must not have, Presentation Manager active. If such a dialog window is displayed, select the correct target operating system, and select the **OK** button.

   After the generation of the casprep file, you should get an information window that displays a successful completion.

Some products, such as MPTS and LAN Server, don't care about of the Target Path specification. They only need the Target Drive, because the path is set by the application itself.

d. Now select **Convert casprep file to Command file** from the Select CASPREP source file window if you want to convert the file into a LAN CID Utility client command file.

   After successful completion a confirmation window is displayed.

7. Select **Cancel** at the LAN CID Utility casprep/command files window if you are finished with creating client LCU command files.
8. You may now check the newly created client LCU command file for the workstation called CLIENT1. Change to the code server's directory to show d:\SHAREA\CLIENT, and edit the CLIENT1.CMD file.
9. Before you start your remote workstation, you must create product-specific response files adapted to the client's needs. See 2.9.4, "Creating Product-Specific Response Files" for information on how to do it.
10. You can now start your remote workstation with the client boot diskettes. Enter the workstation name CLIENT1 when prompted.

2.9.4 Creating Product-Specific Response Files

This section will describe how to create product specific response files. Each product from IBM comes with utilities that create response files for you.

Note: In this section, the OS/2 Client's name is always CLIENT1. The DOS Client's name is CLIDOS1.

2.9.5 Definition of a Response File

- A response file is an ASCII file that supplies the client-specific configuration information required during redirected installation of a product on the client. The response file contains predefined answers to the configuration questions that users are normally asked during a product installation.
- A response file contains pairs of keywords and values that are interpreted during a product installation. Usually, these keyword=value pairs are unique to a particular product.
- Not all products support the use of a response file. If the product you are installing does, the response file makes it unnecessary for you to sit at each client and manually enter an answer to each question that is displayed during installation.
- A response file is not invoked directly. Instead, a response file is specified as a parameter value for an installation program. The installation command can be defined in the LAN CID Utility REXX command file or in the change profile for NetView DM/2 2.1 The response file directs the processing of the installation for a particular product.

- Comments are indicated with an asterisk. Any line beginning with this character will be ignored, blank lines as well.
- Statements do not have to start in the first column.
- Response file statements are not case sensitive.
- Naming conventions:
  - The response file should always be named the same as the client's workstation name. For example:
    - The workstation's name is: CLIENT1
    - The response file should also be named CLIENT1.RSP

      Note: Exception: If you want to use default response files that do not differ from other clients (for example, an OS/2 response file) then the response file can be the same for all clients.
  - Follow this naming convention for every product-specific response file. Response files are stored in their product-specific subdirectories on the code server. See the directory discussion in Figure 37 on page 90.

2.9.6 OS/2 Warp Response File

In order to get the sample response file for OS/2 Warp 3.0 and copy it in the CID Tree as a default response file, type the following command:

```
COPY F:\OS2IMAGE\SAMPLE.RSP D:\CID\RSP\OS2F305\DEFAULT.RSP
```

Also, copy the file PRDESC.LST from the F:\OS2IMAGE\PMDD_1 subdirectory to the OS/2 response file subdirectory, and name the file PRINTER.LST. To do this, type the following command:

```
COPY F:\OS2IMAGE\PMDD_1\PROESC.LST D:\SHAREA\RSP\OS2F305\PRINTER.LST
```

Copy the file SAMPLE.RSP to your response file (for example, CLIENT1.RSP) and adapt the keyword=value pairs to your needs. While adapting, consider the table shown in Table 2 on page 110.

Table 2. OS/2 Keyword=Value Considerations

Keyword	Default Value	Suggested Value	Comment
BaseFileSystem	1	1	Set this value to 2 if you want to use FAT.
DefaultPrinter	-	-	Edit file PRINTER.LST and notice the line number of the desired printer. The line number is equal to the DefaultPrinter number.
DiagnosticAids	1	1	Leave this value as it is since FFST/2 needs diagnostic aids, and therefore, all other products like LAN Server, DB2/2, CM/2, and so forth, do also.
ExitOnError	0	1	**This setting is required so that the SDM can get control after the installation is completed.**
Fonts	1	1	Leave this setting as it is, especially if you plan to use CM/2 on the workstation.
FormatPartition	0	1	Set this value to 0 only if you want to migrate the operating system.
RebootRequired	0	0	This setting is required so that the SDM reboots the workstation instead of the SEINST program.
REXX	1	1	LAN CID Utility requires this setting. REXX is required whenever you want to execute REXX commands, whether remotely or locally.

The OS/2 Warp response file we used in our scenarios is shown in Figure 50 on page 111.

```
AlternateAdapter=0
APM=0
BaseFileSystem=1
CDROM=
SCSI=1
ConfigSysLine=SET RestartObjects=StartupFoldersOnly
ConfigSysLine=PauseOnError=NO
CountryCode=001
CountryKeyboard=US
DefaultPrinter=115
DiagnosticAids=1
DisplayAdapter=0
Documentation=1
DOSSupport=1
WIN-OS/2Support=1
DPMI=1
ExitOnError=1
Fonts=1
FormatPartition=1
MigrateApplications=C:,C:\OS2\INSTALL\DATABASE.DAT
MigrateConfigFiles=0
MoreBitmaps=1
Mouse=1
MousePort=0
OptionalFileSystem=1
OptionalSystemUtilities=1
PCMCIA=1
PrimaryCodePage=1
PrinterPort=1
ProcessEnvironment=1
ProgressIndication=1
RebootRequired=0
REXX=1
SerialDeviceSupport=1
ToolsAndGames=1
```

Figure 50. Response File for the OS/2 2.11 Base System Installation

Note: We have chosen to add two new lines to the CONFIG.SYS of the OS/2 Warp after installation. These lines are:

```
ConfigSysLine=SET RestartObjects=StartupFoldersOnly, and
ConfigSysLine=PauseOnError=NO
```

The first one makes only the applications included in the Startup folder or in the file STARTUP.CMD start when OS/2 starts. The second one allows the starting process of OS/2 to continue despite errors within the CONFIG.SYS file. If this line is not included, the CONFIG.SYS processes waits for the user to press a key before continuing to the next line in the CONFIG.SYS file. You may wish to add other lines in CONFIG.SYS in addition to these.

2.9.6.1 Multiple Protocol Transport Services Response File

In order to get a complete Multiple Protocol Transport Services response file, you may use the LAPSRSP utility, which extracts the settings of a current installation. Type the following command:

```
F:\CID\SERVER\MPTS\LAPSRSP  D:\IBMCOM\PROTOCOL.INI
d:\SHAREA\RSP\MPTS50\CLIENT1.RSP /T:C: /I:PRODUCT /U:NEW
```

Note: The LAPSRSP utility is not able to extract TCP/IP configuration settings.

Or, you may use and adapt sample response files that are supplied in the \SAMPLES directory on the third MPTS diskette. Insert the diskette in drive A: and type the following command on an OS/2 command line:

```
PKUNZIP2 A:\SAMPLES\SAMPLES.ZIP d:\SHAREA\RSP\MPTS\SAMPLES
```

The following sample response file configures an IBM Token-Ring Network adapter driver that binds to the IEEE802.2 and Native NetBIOS protocol drivers.

```
INST_SECTION = (
  TARGET = D:
  INSTALL = PRODUCT
  UPGRADE_LEVEL = NEW
  )
PROTOCOL = (
[PROT_MAN]
   DRIVERNAME = PROTMAN$
[IBMLXCFG]
   LANDD_nif = LANDD.nif
   NETBEUI_nif = NETBEUI.nif
   IBMTOK_nif = IBMTOK.nif
[NETBIOS]
   DriverName = netbios$
   ADAPTER0 = netbeui$,0
[LANDD_nif]
   DriverName = LANDD$
   Bindings = IBMTOK_nif
   ETHERAND_TYPE = "I"
   SYSTEM_KEY = 0x0
   OPEN_OPTIONS = 0x2000
   TRACE = 0x0
   LINKS = 8
   MAX_SAPS = 6
   MAX_G_SAPS = 0
   USERS = 6
   TI_TICK_G1 = 255
   T1_TICK_G1 = 15
   T2_TICK_G1 = 3
   TI_TICK_G2 = 255
   T1_TICK_G2 = 25
   T2_TICK_G2 = 10
   IPACKETS = 250
   UIPACKETS = 100
   MAXTRANSMITS = 6
   MINTRANSMITS = 2
   TCBS = 64
   GDTS = 30
   ELEMENTS = 1200
```

Figure 51 (Part 1 of 2). MPTS Response File: IEEE802.2 and NetBIOS Protocol Drivers

```
[NETBEUI_nif]
   DriverName = netbeui$
   Bindings = IBMTOK_nif
   ETHERAND_TYPE = "I"
   USEADDRREV = "YES"
   OS2TRACEMASK = 0x0
   SESSIONS = 130
   NCBS = 225
   NAMES = 21
   SELECTORS = 15
   USEMAXDATAGRAM = "NO"
   ADAPTRATE = 1000
   WINDOWERRORS = 0
   MAXDATARCV = 4168
   TI = 30000
   T1 = 1000
   T2 = 200
   MAXIN = 1
   MAXOUT = 1
   NETBIOSTIMEOUT = 500
   NETBIOSRETRIES = 2
   NAMECACHE = 1000
   RNDOPTION = 0
   PIGGYBACKACKS = 1
   DATAGRAMPACKETS = 10
   PACKETS = 350
   LOOPPACKETS = 8
   PIPELINE = 5
   MAXTRANSMITS = 6
   MINTRANSMITS = 2
   DLCRETRIES = 10
   FCPRIORITY = 5
   NETFLAGS = 0x0
[IBMTOK_nif]
   DriverName = IBMTOK$
   ADAPTER = "PRIMARY"
   NETADDRESS = "4000638700AB"
   MAXTRANSMITS = 6
   RECVBUFS = 2
   RECVBUFSIZE = 256
   XMITBUFS = 1
  )
```

Figure 51 (Part 2 of 2). MPTS Response File: IEEE802.2 and NetBIOS Protocol Drivers

Note: If you are using a locally administered address, adapt the NETADDRESS statement. Otherwise, delete the line.

The following sample response file configures an IBM Token-Ring Network adapter driver bound to the TCP/IP, TCPBEUI and NetBIOS protocol drivers. NETBEUI is configured for logical adapter 0, and TCPBEUI is configured for logical adapter 1.

```
INST_SECTION = (
  UPGRADE_LEVEL = NEW
  TARGET = D:
  INSTALL = PRODUCT
 )
PROTOCOL = (
[PROT_MAN]
   DRIVERNAME = PROTMAN$
[IBMLXCFG]
   NETBEUI_nif = NETBEUI.nif
   TCPBEUI_nif = TCPBEUI.nif
   TCPIP_nif = TCPIP.nif
   IBMTOK_nif = IBMTOK.nif
[NETBIOS]
   DriverName = netbios$
   ADAPTER0 = netbeui$,0
   ADAPTER1 = tcpbeui$,1
[NETBEUI_nif]
   DriverName = netbeui$
   Bindings = IBMTOK_nif
   ETHERAND_TYPE = "I"
   USEADDRREV = "YES"
   OS2TRACEMASK = 0xD
   SESSIONS = 130
   NCBS = 225
   NAMES = 21
   SELECTORS = 15
   USEMAXDATAGRAM = "NO"
   ADAPTRATE = 1000
   WINDOWERRORS = 0
   MAXDATARCV = 4168
   TI = 30000
   T1 = 1000
   T2 = 200
   MAXIN = 1
   MAXOUT = 1
   NETBIOSTIMEOUT = 500
   NETBIOSRETRIES = 2
   NAMECACHE = 1000
   RNDOPTION = 0
   PIGGYBACKACKS = 1
   DATAGRAMPACKETS = 10
   PACKETS = 350
   LOOPPACKETS = 8
   PIPELINE = 5
   MAXTRANSMITS = 6
   MINTRANSMITS = 2
   DLCRETRIES = 10
   FCPRIORITY = 5
   NETFLAGS = 0x0
```

Figure 52 (Part 1 of 2). MPTS Response File: TCP/IP, TCPBEUI and Native NetBIOS

```
[TCPBEUI_nif]
   DriverName = tcpbeui$
   Bindings = ,IBMTOK_nif
   OS2TRACEMASK = 0x0
   SESSIONS = 40
   NCBS = 95
   NAMES = 21
   SELECTORS = 5
   USEMAXDATAGRAM = "NO"
   NETBIOSTIMEOUT = 500
   NETBIOSRETRIES = 2
   NAMECACHE = 0
   PRELOADCACHE = "NO"
   NAMESFILE = 0
   DATAGRAMPACKETS = 20
   PACKETS = 50
[TCPIP_nif]
   DriverName = TCPIP$
   Bindings = IBMTOK_nif
[IBMTOK_nif]
   DriverName = IBMTOK$
   ADAPTER = "PRIMARY"
   MAXTRANSMITS = 6
   RECVBUFS = 2
   RECVBUFSIZE = 256
   XMITBUFS = 1
  )
MPTS = (
[CONTROL]
  Local_IPC      = YES
  INET_Access    = YES
  NETBIOS_Access = NO
[IFCONFIG]
  Interface      = 0
  Address        = 2.2.2.2
  Brdcast        =
  Dest           =
  Enable         = UP
  Netmask        = 3.3.3.3
  Metric         = 0
  Mtu            = 1500
  Trailers       = YES
  Arp            = YES
  Bridge         = YES
  Snap           = YES
  Allrs          = YES
  802.3          = YES
  Icmpred        = YES
  Canonical      = YES
[ROUTE]
  Type           = default
  Action         = add
  Dest           =
  Router         = 1.1.1.1
  Metric         = 1
  )
```

Figure 52 (Part 2 of 2). MPTS Response File: TCP/IP, TCPBEUI and Native NetBIOS

2.9.7 CASSETUP

This Presentation Manager-based program is provided as a utility with MPTS/2. It assists the administrator in preparing a code server and in distributing code. The advantages of using CASSETUP are:

- It is available at no extra charge with OS/2 Warp 4.
- It is easy to use and set up.
- It supports pristine OS/2 Clients.
- It is ideal for small workgroup LANs.

The disadvantages of using CASSETUP are:

- It is not a strategic software distribution product for IBM. As a result, updates or added features may not appear as regularly.
- It does not support any WAN protocols.
- It does not support DOS or DOS/Windows environments.
- It is not recommended for use in an Enterprise Environment.
- It does not maintain a catalog of installed products.
- Error reporting is minimal.
- Some skill is required when setting up.
- It is not automatically installed with OS/2 Warp 4.

Despite these shortcomings, CASSETUP is an effective way of distributing software, especially in a workgroup environment that is purely OS/2. It is quick and easy to set up and allows you great flexibility.

If you have more DOS/Windows clients, it may not suit your needs. Also, if you have a large number of clients using a protocol other than NetBIOS, you may have to use some other software distribution product.

2.9.8 Summary Table

The summary table lists the features that are available within each of IBM's Software distribution manager products. It is not a comprehensive table, but lists most of the features. It is not advisable to select the one with the most features but rather to select the one that matches your requirements as closely as possible.

NVDM/2 and the LAN CID Utility are also included for comparison.

Table 3. IBM's Software Distribution Managers and Their Features

	Software Distribution Manager			
Features	LAN CID Utility	CASSETUP	NetView DM/2 2.1 Extended.	SystemView in Warp Server Software Distribution
Integrated Installation	-	-	-	Yes
PM Application	-	Yes	Yes	Yes
Object Oriented (drag and drop)	-	Yes	-	-
Command Line Interface (CLI)	Yes	-	Yes	Yes
Response File Generator	-	-	-	-
OS/2 CID Software Distribution	Yes	Yes	Yes	Yes
DOS CID Software Distribution	-	-	Yes	Yes
DOS/Windows Software Distribution	-	-	Yes	Yes
Non-CID Software Distribution	-	-	Yes	Yes
LAN Support (Q2)	Yes	Yes	Yes	Yes
WAN Support (Q4)	-	-	Yes	-
Additional products needed	-	-	DB2/2	-
Support for Pristine installations	Yes	Yes	Yes	-
Supports APPC	-	-	Yes	-
Supports NetBIOS	Yes	Yes	Yes	Yes
Supports TCP/IP	-	-	Yes	Yes
Supports IPX	-	-	-	Yes
Suitable for multi-segment LAN	-	-	Yes	-
Suitable for single-segment LAN	Yes	Yes	Yes	Yes
Clients can initiate the Software Distribution	Yes	Yes	-	Yes
Server can initiate the Software Distribution	-	-	Yes	Yes
Need an external product to obtain redirected drives	-	-	Yes	-

2.10 Tuning for Performance

This section presents general and specific tuning information for a computer that has OS/2 Warp 4 installed. It starts by looking at some general system setup considerations with regard to processor type, disk type and the amount of memory in your system. Next it looks at the CONFIG.SYS file in detail. System and desktop properties are covered last. The following will be covered:

- General Setup Considerations
- File Systems

- System Tuning
- System and Desktop Properties

2.10.1 General Setup Considerations

There are some basic considerations that need to be made about the computer that you will install OS/2 Warp 4 on. They break down into three elements:

- Processor
- Disk
- Memory

2.10.1.1 Processor

In most cases the processor that you have in your system has a minimal impact on performance compared to the amount of memory and the speed of the disk. You want processors that can be upgraded and those that support instruction caching, sometimes referred to as Level 1 or Level 2 cache. There really is no optimum level instruction cache size. More instruction cache is usually better than less. If you intend to run the OS/2 Warp 4 VoiceType function you will require a Pentium processor running at a minimum of 90 MHz.

2.10.1.2 Hard Disk

Probably the most important piece of hardware on your system is the hard disk. It will affect the performance of starting your system, loading applications, the speed of applications, and the general performance of your system.

It is best to have a disk subsystem that uses a bus-mastering type of adapter. Many SCSI devices and some of the PCI devices have this capability. These types of devices allow for multiple requests to be sent to the disk device to be processed rather than just one command or function at a time. They also allow what is called scatter/gather capabilities. Without bus mastering, data that is transferred between the computer's memory and the disk must be in contiguous memory, one byte after the other. With bus mastering, the data does not have to be contiguous and does not have to be on a 64 KB boundary.

Bus-mastering relieves the system of a lot of overhead and therefore performs faster in actual usage. You will see little or no difference when running benchmarks, since when benchmarks are being run, they tend to be the only thing running in the system and therefore are not competing for memory or other systems resources. Also, buffers, data and code tend to be in contiguous memory and therefore do not require the capabilities that bus-mastering has to offer.

Another consideration with regard to the hard disk is whether or not it has its own caching. If it does and your applications perform mainly sequential disk access, then you can reduce the size of your software disk cache. Hardware disk cache will have little or no effect when the programs perform random disk operations. The hardware

cache will improve the performance of starting the OS/2 Warp 4 operating system and the applications.

2.10.1.3 Memory

Without enough memory your system will run slowly. If you do not have lots of memory, then you must manage the things you install. You should only install fonts, device drivers, objects and applications that you will actually use. You may think that just because you have not started an installed application, it is not using any memory. This is not always the case. Many newer OS/2 applications will register classes and objects with the Workplace Shell or add items into path statements, set statements and the like. Many of these will cause memory to be used even when the program is not running. In some cases, the program will require special device drivers to be installed which also use memory.

Other things that affect memory usage are disk caches, CD-ROM caches, Multimedia Support and buffers. The important factor to consider for the disk cache is that it is designed for general use. Since most systems are not general use, the disk cache should be tuned to the specific system environment to optimize memory usage. We will discuss the disk cache considerations in more detail when we look at the file system options.

When the memory in your system is over committed, that is, the operating system and the programs you are running need more memory than physically available in your computer, OS/2 Warp 4 will page, or swap, executable portions of the operating system, programs, and data that has not been accessed for a while to the disk in order to make room for the needed code and data. In this instance, the disk is the single most important factor in your system with respect to performance.

2.10.2 File Systems

OS/2 Warp 4 supports two file systems for use on your hard disks: FAT and HPFS. No matter which file system is used, there are some basic considerations.

You need to install the file system depending on which operating systems will access the data. If you plan to boot a DOS or Windows system natively, then any data that will be accessed must exist on a FAT disk partition. If you will only be running DOS and Windows applications in an OS/2 Warp 4 VDM (Virtual DOS Machine), then the file system can be HPFS or FAT. Also, when accessing files on a server, and the server file system is HPFS, you do not need to install HPFS on your local client machine. HPFS only needs to be installed on a computer when a partition on a local hard disk is formatted as HPFS.

The amount of memory you have in your machine should affect the decision about which file system to use. When HPFS is installed, it requires a minimum 200 to 250 KB of working set, plus the space allocated for its cache. That is, it reduces the amount of physical memory that is available to programs by 200 to 250 KB. This is a large amount

of memory and is the main reason why FAT is used when OS/2 Warp 4 is installed on a system that contains 4 MB of physical memory.

Regardless of which file system you select, you need to plan for future requirements:

- How will maintenance and fixes be applied?
- Where will applications be installed?
- Where will data reside, etc.?

For temporary files, it is better to have them preallocated and reuse them rather than create and destroy them every time. Extending a file can be almost twice as slow as just writing to a file. Also, if you reuse files, it will definitely reduce the fragmentation in your disk directories. These types of files can be the ones allocated by programs that you run, or can be files you create to pass information between systems, or between processes in your local system.

Now let's look at some specifics with regards to the two file systems.

2.10.2.1 FAT

FAT is best suited for disk partitions that are 80 MB or less in size or that have a limited number of files installed. Usually, 256 files is a good target, with up to 500 acceptable. The number of files becomes important because FAT files are allocated based on a cluster size. The cluster size is determined by the size of the disk partition and can be 2 KB, 4 KB, 8 KB or higher. Since most file sizes are not an exact multiple of the cluster size, disk space gets wasted. For example, installing DOS, Windows and OS/2 Warp 4 on a 100 MB partition resulted in 2.2 MB of disk space being wasted. A 100 MB partition will use a 2 KB cluster size. If you were to use a 540 MB partition size, then your cluster size would be increased to 16 KB and a significantly greater amount of disk space will be lost.

When OS/2 Warp 4 is allocating space for a file in a FAT partition, it will look for the largest available free space area to write the data or create the file. If lots of files were created and deleted, or expanded, these free space areas become smaller and smaller and are spread out over the disk. This is referred to as fragmentation. When a file is stored in many areas on the disk, it takes longer to read that data simply because the disk head has to do more seeking.

The FAT file system disk cache is defined by the DISKCACHE= statement in the CONFIG.SYS file. Each time OS/2 Warp 4 is booted, it will allocate space for the disk cache based on the amount of physical memory that is installed in the system. If more than 8 MB is installed, 10% of the physical memory will be used for the disk cache up to a maximum of 4 MB. Based on what applications and support you install in your system, this may be too high and cause you to over commit your memory. If there is not a lot of disk work done on your system, or you are using DB/2 or HPFS, then you should reduce the size of your disk cache. A number between 128 and 256 KB is sufficient for most systems. On a 4 MB system, we set the disk cache to 48 KB.

The minimum cache size that can be allocated is 32 KB while the largest is 14.4 MB. Even if you only use HPFS on your system, the FAT cache, along with lazy writing, will be used for diskette drives. In this case, you would want to set the minimum FAT cache size to 32 KB.

In conjunction with the cache size, you should also set the cache threshold. This determines which records being written or read will be placed in the cache. The default is a record size of 2 KB. What this means is that a record whose size is greater than 2 KB will not be placed in the cache and will have to be read from the disk device if it is accessed again. The 2 KB default is good for cache sizes that are less than 128 KB. If your cache size is 128 KB or larger, increase this value to at least 16 KB or preferably 32 KB. More detail about this parameter and the DISKCACHE= statement will be given in the section on CONFIG.SYS.

Some additional items for improving performance using FAT are:

- Group files by usage, the most used files first, and least used files last.
- Group files based on whether they are static or dynamic. All dynamic and temporary files should be placed in a separate partition.
- If possible, place all temporary files in a single directory.
- If possible, permanently create temporary files and reuse them.
- Only create directories that are really needed. The fewer number of directories you have to search, the faster your search will be.

Defragment your partitions after installing new applications, deleting files or applying maintenance and fixes. Most DOS defragmentation programs that are aware of hidden files can be used. You may also wish to look at J&J Utilities for OS/2 produced by J&J Computer Consulting, and the different GammaTech utilities produced be SofTouch Systems, Inc. These utilities are aware of EA files and tend to be safer to use.

2.10.2.2 HPFS

HPFS does away with some of the concerns that are prevalent with FAT. Files are allocated based on a 512-byte granularity instead of a cluster size; therefore fragmentation is greatly reduced. Also HPFS is especially efficient when handling large partition sizes (greater than 100 MB), and large numbers of files (greater than 500 MB). One thing you should try to avoid is allocating more than 5000 files in a subdirectory or directory. When you exceed 5000 files, you will start to degrade performance. The HPFS file system shipped with the OS/2 Warp 4 product has a cache limit of 2 MB. There is no such limit when using the HPFS386 file system that comes with the Warp Server products.

With HPFS, you specify the cache size and the caching record threshold size in the IFS statement in the CONFIG.SYS file. As with FAT, you should specify the size of the largest record that can be placed in the cache (cache threshold value). The /CRECL parameter is used to define this by specifying a number in terms of kilobytes. 32 KB is

usually a good starting value. The range can be from a low of 2 KB to a maximum of 64 KB and must be expressed in increments of 2 KB. If it is not, the value will be rounded up to the nearest 2 KB boundary.

As mentioned earlier, the big drawback to HPFS is the amount of extra memory that it requires. Even if there is no HPFS partition on your system, it will cost between 200 KB and 250 KB in working set memory, as well as the space for the HPFS cache. If you are installing OS/2 Warp 4 on an existing DOS and/or Windows system, you should not install HPFS. When your system is up and running, you can check the working set of your system. If there is enough free memory and you wish to create a HPFS partition, then you can use Selective Reinstall to install the HPFS support. Remember that any data stored in the HPFS partition can not be accessed if you boot your machine under DOS.

Another advantage of HPFS over FAT is in the area of extended attributes (EAs). EAs are data attached to a file and used to provide information about the file they are attached to. For example, the name of an object that appears in an OS/2 folder or on the OS/2 Desktop is stored in EAs. In HPFS, EAs are part of the HPFS file control block which is read when the file is open. In FAT, EAs are stored in a separate file in separate clusters and require additional I/O to access them, and are therefore slower.

2.10.3 System Tuning

Before covering OS/2 system tuning, let's review the concept of threads and how they are used in OS/2.

Every program that you run on an OS/2 system will process as one or more threads. All programs, DOS, Windows and OS/2 use a minimum of one thread. Each thread executes at a given priority. The priority is used by OS/2 to determine which thread gets to run when more than one thread is ready to run.

The highest-priority thread that is ready to run will be the one dispatched by the system and given time to run. It is given what is referred to a "time slice." This is a set period of time during which a thread is allowed to run. After this time has expired, the highest-priority thread that is ready to run will be given its own time slice in which to run. If the same thread still wanted to run, and it was the highest-priority thread, it would receive another time slice to run in.

OS/2 programs usually run at normal priority, which is 200. Under program control, the program can change its priority to be server class (300) or time-critical (800). It can also change its subclass priority between 0 and 31. A thread that has priority 200 and a subclass of 15 has a higher effective priority than a thread with priority 200 and subclass 0, and therefore runs first.

OS/2 Warp 4 will give OS/2 threads a priority boost for specific types of functions and states. A priority boost means that the priority of the thread is changed for a given time slice to give it higher priority than other threads. This allows these threads to process

more quickly and therefore improve their responsiveness to the user. Following is a list of priority boosts that can be given to a thread. They appear in descending order.

- Disk I/O

  When an interrupt is received stating that a disk operation has completed, the thread that processes this state will receive a priority boost for one time slice to process this interrupt. This applies to threads whose process has foreground focus. Foreground focus means the process that owns the window that is highlighted on the computer panel.

- Starved

  In the CONFIG.SYS file, there is a statement MAXWAIT=3. The number 3 specifies how many seconds a thread can be in the ready-to-run state without having received time to run. If a thread had been waiting to run for 3 seconds, or whatever value is specified in the MAXWAIT statement, its priority would be raised to give it an opportunity to run.

- Keyboard

  This is a boost in priority given to a thread when it is interacting with the system keyboard. Basically, it is for accepting typed-in data.

- Foreground

  This is a priority boost given to all threads of the program that owns the active window on the OS/2 panel, that is, the one that is highlighted.

- Windowed

  Threads that have windows showing on the display will also receive a priority boost when drawing or writing into that window.

When a thread is in more than one of these states, the system will combine the states and give a priority based on the combined states.

For DOS and Windows applications, the Foreground, Windowed, and Keyboard states do not apply. The routine that handles the mouse or keyboard interrupt will receive a boost in priority to handle the interrupt, but the application does not receive a priority boost. If the DOS Setting INT_DURING_IO is specified, a second thread is used to handle the I/O interrupt, and that thread is given an interrupt boost.

Idle class is the other priority class that exists in OS/2. This priority level runs only when nothing else in the system wants to run. Threads in this class will not receive any of the state boosts. If DOS and/or Windows applications are being run, then you should avoid the use of threads that run in idle class because they may never run but will take up system space.

2.10.3.1 The CONFIG.SYS File

Now let's look at specific things in the CONFIG.SYS file that you can change to affect the performance of your system. First we cover those statements that you should *not*

modify unless you have a system which has a special use, such as a process control system.

- PRIORITY_DISK_IO=YES

  This allows the application that has focus to receive a priority boost when its disk operation is complete. This applies to the first time slice given to the thread after the disk operation is complete. After the time slice, the state is reset for the thread and the priority boost removed.

- MEMMAN=SWAP,PROTECT

  Allows OS/2 to swap program instructions and data to disk when more memory is needed than is physically available in your computer. If you do not specify SWAP, you will need enough physical memory in your computer to hold all the program instructions and data that OS/2 and your application needs to run. You do not pay a penalty by specifying SWAP and then not using it.

  The PROTECT parameter allows dynamic link libraries (DLLs) to allocate protected memory. Protected memory is memory that is protected from being accessed by unauthorized programs.

  You can also specify a COMMIT parameter. This forces the system to ensure that enough physical memory or swap file disk space is available for a memory object when it is created. Normally, OS/2 commits physical and disk memory when the page of memory is actually touched. Specifying this parameter can significantly increase the amount of space your swap file uses on disk. You would usually only specify COMMIT if you were developing applications or systems and wanted to see the maximum amount of memory and disk space that could be required for your system.

- TIMESLICE=X,Y

  This statement is not found in the CONFIG.SYS file after you install OS/2 Warp 4 but can sometimes be added. In OS/2 Warp 4, we dynamically modify a thread's time slice based on actions that have occurred. For instance, if a thread took a page fault during its time slice, we give it an extra time slice to process what is contained in the faulted page.

  We also give applications doing disk I/O extra time slices if the data they are reading is in the disk cache. When the TIMESLICE=parameter is used, none of these actions will occur. Instead, each thread will be given the minimum time slice of X, and its time slice will not be allowed to go beyond value Y.

- PRIORITY=DYNAMIC

  If DYNAMIC is not specified, then each thread will only run at the priority that has been assigned to it by the developer of the code. None of the priority state boosts described earlier will be applied.

- DEVICE=C:\OS2\BOOT\VDISK.SYS

Allocates a virtual disk in your computer's physical memory. It is used for quick access to often-used files and programs. This was good for a DOS environment where the extra memory in your computer was not used by DOS, but OS/2 uses this memory, and your performance can be adversely affected if a virtual disk is used. It is much better to increase the size of the disk cache if you have unused physical memory than it is to use VDISK.

Now let us look at statements in CONFIG.SYS which you should change to help improve the performance of your OS/2 Warp 4 system.

- LIBPATH=

  Tells the system where to find DLL files and printer device drivers that OS/2 Warp 4 and applications use. Place the directory names in order of usage. The most accessed directory should be first, the least used last. If possible, place the DLL used by a program in the same directory as the working directory when the program is running. Then you do not need to add that directory to the LIBPATH statement. Also, place all directories that are on a network at the end of your LIBPATH statement in case the network goes down and they cannot be accessed.

  When you try to access a network drive that is not active, you will have to wait for an error time to occur before processing can continue. This can be as much as 15 seconds or longer. See the discussion of dynamic LIBPATH support later on in this section for additional considerations when accessing network drives.

- SET PATH=

  Is used to specify where OS/2 Warp 4 searches for executable program files, EXE, COM, CMD, BAT, etc. Place the directories in order of most used first, least used last. If programs will be executed from an object on your desktop or folder, specify the path there and not in the PATH statement. Only place directories in the PATH statement for executable files that will be called from other programs, commands interpreters or command line interfaces.

- SET DPATH=

  The same principle as for the SET PATH= statement applies to DPATH. For resources that applications use, place the most used directories first and the least used last. DPATH is used to define the search path for finding data files.

- BUFFERS=90

  Physical memory used to support partial sector reads and writes in a FAT file system environment. They are also used to cache FAT directory entries and for swap file disk I/O. Because BUFFERS are used to cache FAT directory entries, this number should not be reduced below 60, unless you are not using the FAT file system on your disks. Reducing this number will increase the number of disk reads that are done to the FAT directory entries and therefore slow down your system.

- MAXWAIT=3

Specifies the maximum amount of time that a thread will be in a ready- to-run state without receiving a time slice to run in. After this time expires, the thread will be given a boost in priority so it gets a chance to run. Reducing this value to 2 may help in systems where there are a lot of programs running, or multiple separate DOS/Windows sessions running. Reducing it to 1 on systems where there is swap activity taking place can slow down the system.

- DISKCACHE=D,LW,t,AC:

  Is used to specify the amount of physical memory set aside to cache data that is being read from or written to disk partitions that are formatted for FAT. When OS/2 Warp 4 see "D" specified in the DISKCACHE statement it will allocate a disk cache size from 48 KB to 4MB, based on the amount of physical memory you have in your system. If you have more than 8 MB in your system, D will cause 10% of your system's physical memory to be used for the FAT disk cache. Instead of specifying D in the DISKCACHE statement, you should change it to the actual amount of disk cache space you require.

  If you have a system where your programs do not do much disk I/O or where your memory is being used up by your applications, you may want to set this value to 128. Also, reduce this value if you are using the DB/2 product or any other product that provides its own disk data caching. If you have a system that has lots of memory, then you can specify a number bigger than 4 MB. The maximum allowed is 14.4 MB.

  The t parameter is not defined in the default CONFIG.SYS file. It defines the cache threshold for records that go into the cache. The default value is 4. This means that any record that is 4 sectors or less will go into the cache, while those greater than 4 sectors will not. If your disk cache size is 128 KB or larger, add this parameter to the disk cache statement. If known, set this value to the largest record size used. Otherwise, set the value to 32. The range can be from 2 KB (4 sectors) up to 64 KB.

  The LW parameter activates the lazy write or write behind feature. This allows the application to get control back before the data is actually written to disk. A separate thread will write the data from the cache to the disk when necessary or opportune to do so. You should always use this option, and code your applications to open files with a cache bypass option if disk security is imperative.

  The AC: parameter is used to specify which FAT directories should be checked at system boot time to see if they were left in an unpredictable state when the system was last powered off. This usually occurs when the power is lost to your machine and you have not done a shutdown or Ctrl+Alt+Del key sequence prior to losing power. The disk directories specified here will have CHKDSK run against them to clean up any lost files or abandoned clusters.

- SWAPPATH=d,r,s

  Specifies where code and data pages are swapped to on disk when more physical memory is needed than is available in your system. The d parameter represents the path where your SWAPPER.DAT file is located. For systems that have multiple

partitions or multiple disks, this should be placed on the most used directory of the least used disk. Also, try to physically locate the swap file on the disk based on its usage. If you are doing a lot of swap activity, place the swap file at the start of the disk. If it is rarely used, place it at the end.

The s parameter specified the size that the swap file is initialized to when you start your OS/2 Warp 4 system. Make this large enough so that it does not have to grow in size while you are running your programs. You should perform your normal computer functions and look at the size of the swap file when you have the most activity. Then set the value of the s to this size in the CONFIG.SYS file. If you are using the FAT file system, IPL your system under DOS, delete the SWAPPER.DAT file, defragment the disk partition where the swap file will be located, and then IPL your OS/2 system. This should keep your swap file from getting fragmented.

The r parameter specifies the amount of free space that must be in the swap file's drive. The default for this value is adequate and only needs to be changed if you want to be warned earlier about a possible out-of-memory situation.

- THREADS=

  Defines how many threads the system will be able to use. One page of resident memory is needed for approximately every 32 threads that are defined. This memory will be allocated at the time the system is booted. As a minimum, you will need 80 threads to support the base OS/2 Warp 4 system and 3 or 4 OS/2, DOS and or Windows applications. The system will support up to 64000 threads, but typically you will not have enough memory in your system to support more than 300 to 500 threads.

  To calculate the number of threads that you will need in your system, use the formula 54+(2xN)+10, where N is the number of programs that you will run together. If the program requires more than two threads, add in the additional threads. This will insure that you have enough threads in most cases.

  To determine how many threads you are using at any given time, run the PSTAT command from an OS/2 command line. This will show all of the processes that are running on your system, as well as how many threads each process is using. The output is quite long, so you may want to redirect it to file.

2.10.3.2 Additional Considerations

You should only install the device drivers that your programs actually need to run. Do not install extra communication, printer, video or device drivers if they will not be used. Below is a list of device drivers and virtual device drivers that are normally found in CONFIG.SYS and that may not be needed. (Virtual device drivers are used to support DOS and Windows applications and usually have a V at the beginning of their name.)

- VEMM.SYS

  Used to support Expanded Memory use in DOS and Windows programs.

- VXMS.SYS

Supports Extended Memory in DOS and Windows applications.

- VDPMI.SYS

  Supports the DPMI memory access and is required to support all Windows applications.

- VW32S.SYS

  Supplies support for the WIN32S Windows APIs. Not needed for Windows programs that do not use WIN32S APIs.

- IBMxFLPY.ADD

  Where x is either a 1 or a 2. 1 is used for family 1 machines and 2 is for MCA (Micro-Channel Architecture) systems. You do not need both.

- XDFLOPPY.FLT

  Is required for reading diskettes which are written using the XDF (Extended Disk Format) format. These are usually OS/2 and PCDOS 7 Installation Diskettes, printer and video driver diskettes and possibly CSD diskettes. The OS/2 Warp 4 Install, Disk 1 and Disk 2 diskettes do not use the XDF format.

- COM.SYS and VCOM.SYS

  Only required if you will be doing serial or async communications. If you use the selectable CONFIG.SYS option in the Archive and Retrieve feature of OS/2 Warp 4, it is possible to create multiple CONFIG.SYS files, which will contain different device drivers based on your needs.

  For example, you could create one CONFIG.SYS file that is used for maintenance and installation. This one would include the XDFLOPPY.FLT and both IBMxFLPY.ADD drivers plus additional threads. Another CONFIG.SYS used for normal processing could have these device drivers removed and a lower number of threads.

  When maintenance has to be applied to the system, or some additional new products installed, you could boot the machine with the Archive and Retrieval menu active and select the proper CONFIG.SYS to be used. An extension of this would be to archive the CONFIG.SYS and the OS/2 INI files and select those to apply maintenance.

2.10.4 System and Desktop Properties

Let's look at some of the system and desktop properties that can be tuned to improve system performance.

2.10.4.1 System Properties

In the System Setup Folder there are many utilities that are available, including the following:

- Spooler

The drop-down menu of the Spooler icon in the System Setup folder, provides an option to disable the spooler. This can be done without problems when only one job will be active on your printer at a time. This will save a little bit of memory and one process and thread in your system. If you have a dedicated print spool machine, then you should raise the priority of the spooler to its highest point. For nondedicated print spool systems, the priority should remain at the default. You would only increase this if (for example) you raised the subpriority of a DOS session and wanted to print documents while running the DOS session. In this case, you would want to make the priority of the print spooler the same as the DOS session.

- Scheme and color pallets

  You should use solid colors and avoid the use of bitmaps for desktop and folder backgrounds. These particular options use more memory and require more processing time to display them.

- Sound

  Deselect the System Sounds options, unless you like the noises when opening and closing your folders. It costs between 250 KB and 300 KB in working set just to hear the noise. An additional 40 KB or so of working set can be saved by executing DINSTSND.CMD in an OS/2 command session. This will unhook the system sounds from the OS/2 desktop. To get them back, you would execute INSTSND.CMD.

- Font palette

  Only install the fonts that you will actually use in your system. Also, try not to mix fonts in folders or on the OS/2 Desktop. If you do, you will be using extra memory. Outline fonts tend to be a little smaller in terms of memory than bitmap fonts and once they are in the cache, they perform just as fast.

- WIN-OS/2 setup

  When defining a Windows program, select common sessions and make DDE and Clipboard support both private. If floating-point is used in your Windows applications, use the enhanced run mode for Windows. This can give as much as a 20% gain in performance. Also, if you have a Windows application that you always run, it is better to start it via the Startup folder than to use the Fast Load option and start it from the Desktop.

  When you migrate windows applications, or install or add Windows programs to your system, ensure that the run mode for these is the same as the common session run mode. If run modes are different, then you will have two separate Windows sessions running even though you stated that a common session is to be used.

- System

  Disabling the Animation and Print Panel option can save a little in code path, number of program instructions executed, and memory. Setting the System Logo option to None can save some time when loading applications that check this

parameter to see how long to display the application logos. The type-ahead option will use a little more memory. When selecting panel resolutions, remember that the higher the resolution, the more memory is used. Very high resolution and color support can require 100 to 200 KB of physical memory.

- Mouse

  Mouse pointers are basically bitmaps. The amount of memory used will be affected by which mouse pointer style you choose. If you activate the comet cursor, this will cost additional memory and processing time whenever the mouse is being used.

2.10.4.2 Desktop Properties

Desktop properties are selected by choosing the Properties option on the Desktop menu. To display the desktop menu, click the right mouse button once in an empty space on the desktop.

Choosing Automatic Lockup will cause extra code path and processing time to occur. Normally this is very minimal, until the timeout value expires. Then you are looking at about 40 to 50 KB of working set.

If you select **Create Archive** on system restarts, this will slow down your system's boot time. You want to set this option only when you have changed your desktop and/or configuration and want to save it. Once it has been saved, turn this option off. You can get to the Archive Retrieve menu panel when you boot your machine by using the Alt+F1 key sequence.

Remember

All the features, applications and devices you use come at a cost. They all cost disk space, they all use memory, and they all have the potential for slowing your system down. To minimize this, plan ahead. Decide what the system will be used for and what your future uses will be. Then, set up the system accordingly. Install only the things that you are actually going to use and need.

Ensure that there is a match between the software you install and the hardware you install it on. If an application or feature costs more memory than you have, either don't install the feature, or get more memory for your system. Finally, be creative and logical. You can set the system up with different configurations and different support, defined to optimize performance based on the particular functions you perform and applications you use. Become aware of what OS/2 Warp 4 has to offer and use it to your advantage.

2.11 Troubleshooting the Installation Process

If you experience any problems installing OS/2 Warp 4, it is important to determine if you have a hardware or software problems. Since OS/2 Warp 4 has been installed and

tested by IBM, chances are more likely that you have some sort of hardware problem, maybe an interrupt conflict or maybe a base memory address conflict. It is also possible that you could have a hardware incompatibility.

2.11.1 Hardware Considerations

Sometimes it is very difficult to differentiate between hardware and software problems. In this section we will discusses hardware compatibility issues briefly, and describe elements of the PC architecture that can be relevant when doing troubleshooting.

2.11.1.1 Bus Architecture

When troubleshooting OS/2 Warp 4, it is important to understand the bus architecture of the system in question. A bus architecture is a hardware specification that determines how adapter cards communicate with the computer system. PC systems can use any combination of the bus types listed below. However, some combinations are more common than others. Most modern PCs use an ISA bus in conjunction with one of the local bus architectures.

- Industry Standard Architecture (ISA)

  Also known as AT-Bus, was the original bus architecture used by the IBM PC AT. ISA remains the most popular bus for PCs. ISA cards are typically configured using jumpers or dip switches on the card itself.

- Extended Industry Standard Architecture (EISA)

  EISA is an improved, high-speed version of ISA developed by Compaq and others. EISA connectors can accept both ISA and EISA cards, although only EISA cards will reap the performance benefits of the EISA bus. EISA cards are usually configured by software that comes with the card. Some EISA cards support a feature called bus mastering which allows the EISA card to control the EISA bus.

- Micro Channel (MCA)

  MCA is a proprietary high-speed bus architecture developed by IBM for the PS/2 line of personal computers. Micro Channel is not backward-compatible with ISA cards. Micro Channel cards are configured by running the Set Configuration utility on the Reference Disk for the Micro Channel PC.

  On some Micro Channel systems, you might be asked to insert the system's Reference Diskette during the installation of OS/2 Warp 4. On others you might have to patch your OS/2 Warp 4 Installation Diskette manually before OS/2 Warp 4 will install correctly. This procedure is called an Advanced Basic Input/Output System (ABIOS) patch.

  ABIOS is a set of software extensions to the BIOS ROM of a PC. It typically involves copying files from your system's Reference Diskette to the Installation Diskette. See the OS/2 Readme file for more information.

- Local bus

This is a term used to describe several new high-speed bus architectures that attempt to avoid speed bottlenecks by linking directly into the microprocessor bus. There are currently two prevalent local bus standards: VL-Bus and PCI.

  - VESA Local Bus (VL-Bus) is a local bus architecture developed by the Video Electronics Standards Association that is used primarily in 80486-based systems. VL-Bus is actually an extension of the ISA bus, and VL-Bus cards are typically configured through dip switch or jumper settings just as ISA cards are. The VL-Bus architecture is losing popularity to PCI, but there are many VL-Bus systems still in use.
  - Peripheral Component Interconnect (PCI) is a local bus architecture developed by Intel that is used on Pentium systems. PCI has several advantages over VL-Bus and is gradually becoming the dominant local bus architecture. PCI cards are generally auto-configuring. Settings are usually changed either by software that comes with the card or by running the system's configuration utility.

- Plug and Play

  Plug and Play is an extension to the ISA bus. Plug and Play attempts to simplify the configuration of PCs by using better resource management and allowing for automatic configuration of adapters. Plug and Play cards are auto-configuring, but settings can usually be changed by running the software that comes with the card or by running the system's configuration utility. Conflicts can result if Plug and Play and non-Plug and Play devices are used in the same system.

- Personal Computer Memory Card International Association (PCMCIA)

  PCMCIA is a hardware specification for the credit-card sized peripherals (called PC Cards) used in many notebook computers. PCMCIA cards are configured by running software that comes with the card. Of all the bus types listed here, PCMCIA usually causes the most headaches, primarily because of a lack of standardization. PCMCIA support under OS/2 Warp 4 requires that special drivers be loaded. You can use Selective Install to install the drivers. PCMCIA support under OS/2 is three-layered: socket services, card services, and the client enabler (or SuperClient driver) for the card itself.

  - The Socket Services driver provides a low- level interface between card services and the PCMCIA socket controller. It must be loaded before card services or any client enablers or SuperClient drivers. Socket services is system-specific. If you attempt to use Selective Install to install PCMCIA support for your machine, but it does not appear in the list of machines supported by OS/2 Warp 4, you will need to obtain the OS/2 socket services driver from your system's manufacturer.
  - The Card Services driver allocates resources, such as memory, interrupts, and I/O addresses, to the PC Card and its drivers. Card services must be loaded after socket services, but before any client enablers or SuperClient drivers. Card Services is operating system specific and is automatically installed when you install PCMCIA support under OS/2.

- Client enablers are card-specific drivers that configure the card and allow it to be recognized by applications. Client enablers communicate to the card via card and socket services. Each card typically has its own client enabler that is provided by the manufacturer of the card.
- A SuperClient driver is essentially a generic client enabler that can support many different types of cards (modems, network adapters, and so on). OS/2 Warp 4 comes with SuperClient drivers for modems, flash memory cards, and ATA hard disk cards. If your card is not supported by these drivers, you should obtain the OS/2 client enabler from your card's manufacturer.

2.11.1.2 Devices and Conflict Resolution

OS/2 Warp 4 is a multitasking, multithreading operating system. Due to the very nature of these type of high-level operating systems you sometime have some device problems and can often have problems that are caused by hardware conflicts.

To avoid problems in this area use the OS/2 Warp 4 use Hardware Manager to query the information about physical devices, device drivers and the resources that the devices use. You will want to view this information when you are adding new devices to your machine and you need to know which resources are being used by the other devices that are currently installed.

The Hardware Manager icon is located in the System Setup folder and can be accessed by:

1. Double-click on **OS/2 System**
2. Double-click on **System Setup**
3. Double-click on **Hardware Manager**

The Hardware Manager can be viewed in three different ways: Tree, Icon, or Details. All three provide you with detailed information about the devices in your machine. Only devices that are registered with the Resource Manager are displayed in this folder.

2.11.1.3 The Hardware Manager

To ensure you have a working device after you have installed it and its associated device driver follow these steps:

- Locate the Hardware Manager icon following the above mentioned steps. Select **View**, and then select **Details View**. See if the resources, such as IRQ and memory I/O, required for the new device are available.
- Record your current hardware settings as follows (you must have a printer attached to LPT1 to execute the following statements):
  1. Open an OS/2 command prompt.
  2. For a complete listing of your hardware, type:

     ```
     rmview > lpt1
     ```

  3. For a listing of I/O port addresses in use in your system, type:

```
rmview /io > lpt1
```

4. For a listing of Interrupt Request Levels (IRQs) in use in your system, type:

   ```
   rmview /irq > lpt1
   ```

5. If you do not have a printer attached to your system, you can change the redirection to a file instead.
6. Substitute the `lpt1` in the above examples with a file name.
7. Remember to use a different filename for each occurrence of the rmview command.

- If your adapter does not have settings (that is, DIP switches or jumpers), it is a Plug and Play adapter. Resources for these type of adapters are set automatically by the OS/2 Warp 4 Plug and Play Resource Manager.

  If the adapter is not Plug and Play, it has switches or jumpers, set them to match the available resources. For example, you are trying to install a Sound Blaster adapter into your system and the Sound Blaster adapter is trying to use Interrupt Request (IRQ) 11. IRQ 11, however, is already in use by another device. Use a resource that is available, if it does not have a conflict in the Hardware Manager Details View, and set the card appropriately. See the documentation that comes with the adapter to see what settings your adapter can use.

- Use the right mouse button while the mouse is positioned on the Hardware Manager icon. Select **Properties** from the pull-down and go to Detection Level. If you have removed adapters or devices from your system, select **Detect Removed Hardware.** If you have added adapters or devices select **Detect Added Hardware.** If you have both removed and added new adapters or devices, select **Full Hardware Detection.**
- Install your device driver by using Device Driver Install:
  1. Double-click on **OS/2 System**
  2. Double-click on **System Setup**
  3. Double-click on **Install/Remove**
  4. Double-click on **Device Driver Install**
- Shut down and switch off your system.
- Physically install the new hardware or device. Make sure, if it is not a Plug and Play, that you set your switches to non-conflicting resources.
- Switch your system on.
- If the hardware works the device driver installation was successful. The OS/2 Plug and Play configures your system at startup to utilize your new hardware. If successful, save this new configuration as an archive.
- If the installation was unsuccessful, the system might hang or the hardware device might not work. You could get a system message that a device driver was unable

to load. This could be caused by a resource conflict. Restart the system and press Alt+F1 when the white OS/2 bar is in the upper left corner of the panel. From the Recovery Choices menu press F6 to disable hardware detection. After the system is up, go to Hardware Manager and verify again that there is no conflict of resources. Verify that your newly added adapter has registered with the Resource Manager and it appears in the Details View.

- Another recovery action if your system hangs during startup is to restart and press Alt+F2 when the white OS/2 bar appears in the upper left corner. This displays the device drivers as they load on your system. Look at the last device driver that is displayed on the panel before the hang occurs. This is the device driver that is probably causing the problem. Restart the system again and press Alt+F1 when the white OS/2 bar is in the upper left corner during startup. Select **Command Line** from the recover options. Use the TEDIT command to edit the CONFIG.SYS and comment out the statement containing that device driver. For example:

  ```
  REM BASEDEV=IBM1S506.ADD
  ```

  Save the CONFIG.SYS changes and restart your system for the changes to take effect.

- Make sure that the resources assigned to the device driver are not conflicting with other resources in the system. If you can utilize another resource, change the parameter to the correct information or set the adapter settings to that other resource. Correct the problem before you remove the REM in the device driver statement in the CONFIG.SYS.

Additional device drivers can be obtained from:

`http//ps.software.ibm.com/pbin-usa-ps/getobj.pl?/pdocs-usa/enhanced.html`

2.11.1.4 Troubleshooting Hardware Problems

If you are experiencing problems installing OS/2 Warp 4 and you are trying to detect a hardware problem, first ask yourself the following questions:

- Has any new hardware been added to the system recently?
- Is the current hardware functioning?
- Are there any entries in the message log files indicating a hardware problem?

If your answer is Yes to any of the above questions you can continue your problem determination process. This involves some additional questions to be asked and actions to perform, as follows:

1. New hardware was installed

   If new hardware was added to the system just before the problem occurred, see the documentation provided with that hardware. If new hardware was not recently installed, proceed to the next step.

2. Perform a hardware check

A good technique for determining a hardware failure is to attempt to run the failing operation on another similar system. If the operation runs successfully on another system, suspect a hardware failure. Check all switches and personal computer hardware products attached to or installed on the user's workstation to ensure that:

- Power switches are turned on.
- Contrast and brightness controls are properly adjusted.
- Any physical connections to the user's workstation, including electrical outlets, cables, and power cords, are secure and functional.
- If there have been any system changes (hardware or software), make sure that hardware configuration information was properly entered by checking the reference diskettes and INI files.
- If there have been any system changes, make sure that any installed options, such as adapter cards, are designed to be used with your system, that they are installed according to their instructions and that they are properly seated.

  Some devices that attach to your system, such as modems or printers, have test instructions of their own. When testing such attached devices, see the directions provided with those products.

3. Run the hardware diagnostics

   Use the procedures provided with your personal computer. If you suspect a problem is associated with a network adapter, see the documentation provided by the manufacturer of your network adapter card for information about its capabilities and requirements.

4. Problem is not hardware-related

   If you have completed both the hardware check described above and a hardware diagnostics test, and you determine that the problem is not hardware-related, see 2.11.2.1, "Troubleshooting Software Problems" for further actions.

5. Hardware problem

   If the hardware diagnostics procedures indicate a hardware problem:

   - For a personal computer, see the *Guide to Operations* or the *Quick Reference* supplied with the computer.
   - For other hardware devices, see your local hardware personnel, procedures, or documentation.

2.11.2 Software Considerations

It is normally even more difficult to determine a software problem. The following sections will give you some mechanisms to use in identifying software problems.

2.11.2.1 Troubleshooting Software Problems

If you suspect that your problem is software related, or you have already determined that it is not a hardware problem, you can start your software problem determination process by asking the following questions:

- Is the problem associated with a program?
- What is the nature of the problem?
- Are any error messages displayed when the problem occurs?
- Are there any entries in the error log indicating a software problem?

If your answer is Yes to any of the above questions you can continue the problem determination process by completing the following steps. Using these steps you can determine if your software is functioning properly.

1. Problems with a program

   User-written programs can sometimes contain errors that cause problems for system users, especially when a program has not been completely debugged.

   If you suspect that a problem is caused by an error in a program, consult the programmer who wrote the program or the appropriate programming support personnel for assistance. Programmers should follow the writing and debugging guidelines for OS/2 programs contained in the programming publications listed in related books.

2. Describing a software problem

   Describe the problem in your own words or in the words of the user who reported the problem. Then review the questions and record your answers to these questions.

   Answer the following questions to describe the software problem.

   - How would you describe the problem?
     - What are the tasks that the user cannot perform?
     - Does the workstation fail to respond when the keyboard keys are pressed?
     - When Num Lock is pressed, does the Num Lock light turn on or off?
   - What was going on when the problem occurred?
     - Which of the following sessions was the user working in: An OS/2 graphical user interface, an OS/2 window or a DOS session?
     - What applications (for example, editor or spreadsheet) were being used when the problem occurred?
     - Did the system stop when the problem occurred?
     - What is the exact sequence of events, including user actions, that led to the problem?
     - Were these actions successfully performed in the past? If yes, was there anything different about the way or circumstances in which they were attempted when the problem occurred?
     - Stop all operations not related to the failing task. Does it still fail?
     - Were there any indications (messages or otherwise) that a problem might occur? If the user received any messages, request that the user note the message identification number, the message text, and any error codes

contained in the message. If possible, correct all problems reported by messages and ensure that any messages previously generated have nothing to do with the problem being worked on.

- Are there any special or unusual operating circumstances?
  - Is this a new program?
  - Are new procedures being used?
  - Are there recent changes that might be affecting the system? Has the OS/2 program been changed since the program or scenario last ran successfully? If you suspect that the problem has been caused by, or is related to, such a change, record this information.
  - For programs, what specific application programming interface (API) calls were being made?

3. Responding to Error Messages

   If the user received an error message on the display panel or in a message log, respond to the error message.

   The following responses are available:

   - Responding to abend messages

     A message displayed on the panel can indicate an abnormal termination, such as a trap error. The following is an example of a fatal error:

```
SYS3175
A program generated an access violation at 000149a.

P1=00000000    P2=ffffffff    P3=  XX    P4=  XX
EAX=0000ff26   EBX=00000986   ECX=00000000   EDX=7991d4bf
ESI=00000860   EDI=00000860
DS=001f  DSACC=00f3   DSLIM=00004cbf
ES=0000  ESACC=****   ESLIM=********
FS=150b  FSACC=00f3   FSLIM=00000030
GS=db47  GSACC=00f3   GSLIM=0000fe1f
CS:EIP=000f:0000495a   CSACC=00fb  CSLIM=0000d871
SS:ESP=001f:000344a6   SSACC=00f3  SSLIM=00004cbf
EBP=000044ac  FLG=00012246
```

     Use the OS/2 HELP command to get additional information on system errors. For the above error, enter:

```
help sys3175
```

     An example of a local alert error message follows:

```
NET3035:  Failed to authenticate with swat, the domain controller
    for domain swat500.
```

     Use the OS/2 HELP command to get additional information about local alert messages. For the above error, enter:

```
help net3035
```

If you suspect a particular component might be associated with the abnormal termination, proceed as follows:

- If the operating system reported an abnormal termination, see 2.11.3.2, "Problems during System Startup" on page 142 and what follows for further information.
- If some other program reported an abnormal termination, see the documentation that came with that program.

- Responding to an inappropriate message

  If you suspect an inappropriate message has been displayed, for example, a message describes a problem that does not exist, or it describes a problem that is associated with a different operating environment from the one the user was accessing, then follow these steps:

  - Verify that the user followed the instructions in the help facility but was unable to resolve the problem.
  - Record the message identification number, including the alphabetic prefix, and any return, error, or reason codes or statement type. The alphabetic prefix indicates the software component that generated the message.
  - Display message help text and respond to any special instructions.
  - The message text may point to a problem category. See "Software Problem Categories" on page 140 for more details.

  If you suspect that a particular component is associated with an inappropriate message, proceed as follows:

  - For the base operating system, see 2.11.3.2, "Problems during System Startup" on page 142 and related sections for additional information.
  - If some other program reported an abnormal termination, see the documentation that came with that program.

- Understanding Message Prefixes

  The alphabetic prefix of a message indicates the component that generated the message. Following are examples of message prefixes:

aud	Audit
cds	Cell Directory Service
cfg	Configuration API
csr	Code Set Registry
dcecp	DCE Control Program
dced	DCE Host Daemon
dcf	DCE Configuration messages
dts	Distributed Time Services messages
DXM	LAN Support Program device driver

FT	DSS Fault Tolerance
gss	Generic Security Service messages
idl	Interface Definition Language messages
lib	Library messages
mcl	Managed Object Class Library messages
NET	Client and File and Print Services messages
LSI	LAN Server Installation
LT	LAN Adapter and Protocol Support
NTI	Networking Products Installation
PRO	Protocol Manager Component (protman.os2)
RGY	Registry
rpc	Remote Protocol
sec	Security Service
ssa	Simple Network Management Protocol (SNMP)
svc	Serviceability
threads	Usually programming error
SYS	OS/2
tcl	Tool Control Language
UPM	User Profile Management

- Classifying Software Problems

  Perhaps no messages associated with the problem were logged nor appeared on the panel of the client or the server. Perhaps the user was unable to resolve the problem using the available message help facility. The next step is to try to classify the problem by component and category.

  Component refers to the portion of the system software (such as the operating system, server, or client) that caused or reported the problem.

Software Problem Categories: A general description of several categories of software problems follows:

- INSTALL

  Problems caused by program changes, experienced during or resulting from the installation of OS/2 Warp 4, or new hardware can be classified as installation problems.

- ABEND

Refers to a recurring or unrecoverable problem caused by a program defect that unexpectedly ends processing by a component, a program, or a function. An abnormal termination can result from a software compatibility problem or from problems associated with the hardware configuration of the workstation.

- WAIT/LOOP

  If the user's keyboard is locked (there is no response when pressing any keys) or if the program is not responding as it should, an unexpected program suspension, referred to as a wait, might have occurred.

- PERFORMANCE

  Many performance problems can be resolved through system tuning. Before proceeding to directions for a particular component, check the CONFIG.SYS file entries to ensure they are appropriate for the number of programs and files currently running on your system. A performance problem can also result from a software compatibility problem or from problems associated with a workstation's hardware configuration.

- DOCUMENTATION

  If a problem with the software documentation results in lost time for the user (or for other users), please report it. Documentation problems include incorrect or insufficient help information and inaccurate procedures. Report documentation problems by using the document's reader comment form, if one is available.

- INCORRECT OUTPUT

  The display of unexpected data, or the loss or failure of data that should be displayed, can indicate incorrect output problems. For user-written programs, this type of problem commonly results from incomplete debugging of a program.

- MESSAGES

  Recurring, inappropriate, or unhelpful messages can indicate message problems. Message problems also occur when a user takes the action indicated in a message, but the action does not resolve the problem.

2.11.3 Problem-Solving Techniques

The following sections will concentrate on common problem areas. It will guide you through some problems you might encounter during the installation of OS/2 Warp 4. This section is intended to serve as a problem-solving guide. It may not solve all your problems and in some instances you will have to contact your IBM representative for additional information.

2.11.3.1 The CONFIG.SYS File

The CONFIG.SYS file is one of the most important files in OS/2 Warp 4. It contains lines of instructions that control how your computer starts up and how it works with the devices attached to it.

During installation, the CONFIG.SYS file is copied from OS/2 CD-ROM and added to your root directory. There might be instances in which you will be instructed to edit your CONFIG.SYS file in order to add a statement, remark out (REM) a line, or modify an existing line in the file. If you need to alter the CONFIG.SYS file after you install OS/2, you will need to make the changes to the CONFIG.SYS file located in the root directory on the hard disk (usually drive C).

Note

If the CONFIG.SYS file is changed incorrectly, you might not be able to restart your computer. Be careful when editing the file.

To edit the CONFIG.SYS file in your root directory (after installing OS/2 Warp 4), follow these steps:

1. Double-click on **OS/2 System**
2. Double-click on **Command Prompts**
3. Type:

   ```
   Copy config.sys config.old
   E C:\config.sys
   ```

   The CONFIG.SYS file will appear on your panel, and you can make changes to it.
4. When you are finished working on the file, click on **File**
5. Click on **Save**
6. Click on **Type**
7. Click on **Plain Text**
8. Click on **Set**
9. Press Alt+F4 to exit
10. Shut down and reboot

For more information about the statements that can appear in the CONFIG.SYS file, refer to the Command Reference that is located in the Information folder on the OS/2 Desktop.

2.11.3.2 Problems during System Startup

If for some reason your system isn't starting properly, you can try the suggestions provided in this section. The information provided resolves the following problems you might encounter during startup.

- Boot Manager Menu Does Not Appear

If you installed the Boot Manager partition but the Boot Manager startup menu does not appear as expected when you start the system, you will need to make the Boot Manager partition startable. Do the following:

1. Turn on the computer. If the computer is already on, press Ctrl+Alt+Del to restart it.
2. When a small white box appears in the upper left-hand corner of your panel, press Alt+F1.
3. When the Recovery Choices panel appears, press F2.
4. When an OS/2 command prompt appears, type FDISK and press Enter.
5. When the FDISK panel appears, highlight the Boot Manager line and press Enter.
6. On the Options menu, choose **Make Startable** and press Enter.
7. Press F3 to exit the FDISK utility.
8. Restart your system.

- Dual Boot Does Not Work

  If the BOOT command is unsuccessful when you try to switch from DOS to OS/2, you might have one or more active terminate-and-stay-resident (TSR) or DOS cache programs. If so, end the programs before you use the BOOT command. For TSR programs that are loaded from AUTOEXEC.BAT, you must deactivate the programs before using the BOOT command.

2.11.3.3 Display-Related Problems

If your display isn't working properly, you can try the suggestions provided in this section. The information provided resolves the following problems you might encounter with your display:

- White panel after installation

  If the display panel is white after installation and there is no system activity, set the video adapter to operate on an 8-bit bus and move the adapter to an 8-bit slot. If possible, disable the autosensing capability of the video adapter. For information on modifying these properties, refer to the documentation that came with your video adapter.

- System stops at logo panel

  If the system stopped running with the logo panel displayed, there might be a conflict with the interrupt properties of your hardware devices. Check all interrupt request (IRQ) properties on all your hardware devices and make sure that each one is using a unique IRQ. Future Domain controllers are shipped from the factory preset to use IRQ5. However, IRQ5 is the interrupt that is normally assigned to LPT2. Also, it is common for IRQ5 to be used by sound or communications adapters. You might not see a problem immediately because of interrupt conflicts, but eventually a problem can occur.

- System will not restart on a high-resolution display

  If you installed support for a high-resolution display adapter and your system will not restart, follow the procedure below. This procedure will set the adapter support to a lower resolution (VGA) but will enable your system to start.

  1. Turn on the computer. If the computer is already on, press Ctrl+Alt+Del to restart it.
  2. When a small white box appears in the upper-left corner of your panel, press Alt+F1.
  3. When the Recovery Choices panel appears, press F3.
  4. Use Selective Install to install support for another high-resolution display adapter.

- Graphics mode and refresh rates incorrect for hardware

  Most video adapters are sensitive to the characteristics and capabilities of the display attached to them. The video BIOS on these adapters detects and sets the hardware to support a desired graphics mode.

  Some adapters have configuration DIP switches to select desired vertical refresh rates for high-resolution modes (800 x 600 and 1024 x 768). Others are shipped with DOS video-configuration utility programs that allow selection of refresh rates. Usual refresh rates range from 56 Hz to 72 Hz non-interlaced or 88 Hz interlaced. The display has to be capable of synchronizing to this frequency for proper mode setup.

  When the desired refresh rate has been set using either the DIP switches or the video-configuration utility program, run the \OS2\SVGA.EXE utility program to store the hardware setup in an \OS2\SVGADATA.PMI file. At a DOS full-panel session, type:

  ```
  C:\OS2\SVGA ON
  ```

- The installation program only installed VGA

  During the installation of OS/2 Warp 4, the installation program might have installed only VGA support for your display. To install the Super VGA (SVGA) drivers, you can use Selective Install in the System Setup folder.

- Video Corruption or Stacked or Missing Icons

  1. Display the Desktop pop-up menu (click mouse button 2 on the OS/2 Desktop background).
  2. Click on **View** and then **Refresh** to redraw the Desktop.
  3. If the panel goes blank, press Alt+Esc (to switch between the programs) to force repainting of the panel.

- Color icons and bitmaps improperly drawn

The resolution or refresh rate loses synchronization under OS/2 but not DOS. To correct this problem, generate the \OS2\SVGADATA.PMI file under a specific version of DOS using the following instructions:

1. Start DOS.
2. Type `\OS2\SVGA ON DOS`
3. Type `RENAME \OS2\SVGADATA.DDS \OS2\SVGADATA.PMI`
4. Reboot OS/2.

If this does not fix the problem, try selecting a different vertical refresh rate (refer to your adapter manual), then generate the PMI file again.

If your display remains out of synchronization or is stable and synchronized after restarting the system but loses synchronization after a session switch, this might be due to your video adapter's hardware implementation.

- Synchronization lost under OS/2 but not DOS

  Windows programs that use color icons or color bitmap backgrounds must run in the foreground to be drawn properly. Do not switch from a Windows program while it is being started or before it completes drawing color icons and color bitmap backgrounds.

- Corrupted colors in DOS programs

  Some DOS programs experience color corruption when running in a window on the Desktop in VGA mode. This is a limitation of the VGA mode, because the color palette of the DOS session has to be translated to the Presentation Manager, and the Desktop in VGA mode does not offer enough colors to do an optimal translation. The best solution is to use an OS/2 display driver that supports the 256-color mode, or run the program in a DOS full-panel session.

- Text strings clipped on display

  OS/2 uses a system proportional font that is designed to meet the International Organization for Standardization (ISO) 9241 standard and the German DIN 66234 standard when using certain ISO-compliant hardware. If you do not want to use ISO-compliant fonts, you can modify the OS2.INI file to install fonts that are not ISO-compliant. Font changes made in the OS2.INI file are global across all programs. If you have REXX installed, you can type the following information into a CMD file and use it to change the font:

```
/*Remove ISO font*/
call RxFuncAdd "SysIni", "RexxUtil", "SysIni"
AppName = "PM_SystemFonts"
KeyName = "DefaultFont"
FontName = "10.System Proportional Non-ISO"
call SysIni "USER", AppName, KeyName, FontName||"0"x
exit
```

  After the file has been run, shut down and restart the system.

- Blank panel on IBM ValuePoint system

  If you have one of the IBM PS/ValuePoint System Models 6382, 6384 and 6387, you might encounter a blank panel while switching from one window to another. For these systems you must be on a BIOS level of at least 62. Contact IBM support desk for more information.

2.11.3.4 Mouse-Related Problems

If your mouse isn't working properly, you can try the suggestions provided in this section. The information provided resolves the following problems you might encounter with your mouse:

- Mouse not working after installation

  If a mouse was installed at the same time OS/2 Warp 4 was installed, or you used Selective Install to install a new mouse, and the mouse is not working, you will need to edit your CONFIG.SYS file. Do the following:

  1. Edit the CONFIG.SYS file
  2. Delete the mouse device-driver statements from the CONFIG.SYS file (there might be more than one such statement). For example:

     ```
     DEVICE=C:\OS2\BOOT\MOUSE.SYS
     ```

  3. Shut down the system, and then restart it.
  4. Use Selective Install to install a different mouse driver.

- Mouse does not work on COM3 or COM4

  OS/2 supports connection only to COM1 or COM2, at the standard input/output (I/O) address and interrupt request (IRQ) setting. You can configure additional serial ports as COM3, COM4 and so on. To add additional COM ports edit the following line in your CONFIG.SYS:

  ```
  DEVICE=C:\OS2\BOOT\COM.SYS (n,addr,irq)
  ```

  where `n` is the port number, **addr** is the adress of the port and `irq` is the interrupt of the port.

- Mouse pointer does not move

  If you move your mouse and the mouse pointer on the panel does not move, verify that each device on your computer that uses an IRQ setting is not conflicting with another IRQ setting.

- Mouse statements in CONFIG.SYS

  The mouse statements that should appear in your CONFIG.SYS file depend on the type of mouse connected to your computer. The correct CONFIG.SYS statements for running a serial mouse are:

```
DEVICE=C:\OS2\MDOS\VMOUSE.SYS
DEVICE=C:\OS2\BODT\POINTDD.SYS
DEVICE=C:\OS2\PCLOGIC.SYS SERIAL=COMx
DEVICE=C:\OS2\BOOT\MOUSE.SYS TYPE=PCLOGIC$
```

Where `C` is the drive on which OS/2 Warp 4 is installed, and `COMx` is either COM1 or COM2.

The correct CONFIG.SYS statements for running a Microsoft or IBM mouse are:

```
DEVICE=C:\OS2\MDOS\VMOUSE.SYS
DEVICE=C:\OS2\BOOT\POINTDD.SYS
DEVICE=C:\OS2\BOOT\MOUSE.SYS
```

Where `C` is the drive on which OS/2 Warp 4 is installed.

- Erratic mouse pointer in WIN-OS/2 sessions

  If you have an erratic pointer in your WIN-OS/2 programs, set the following WIN-OS/2 properties:

  ```
  MOUSE_EXCLUSIVE_ACCESS to On
  IDLE_SENSITIVITY to 100
  IDLE_SECONDS to 20
  ```

- Existing mouse not working correctly

  If the mouse you had connected to your computer before OS/2 Warp 4 was installed now works improperly (movements appear "jerky" or the mouse does not respond when you move it), do the following:

  1. Double-click on **OS/2 System**
  2. Double-click on **Command Prompts**
  3. Double-click on **OS/2 Window**
  4. Type `ATTRIB -R C:\OS2\BOOT\MOUSE.SYS`
  5. Insert the diskette that came with your mouse into drive A.
  6. Type `COPY A:\MOUSE.SYS C:\OS2\BOOT\MOUSE.SYS`
  7. Shut down and reboot

- Logitech mouse not working after installation

  If you have a Logitech mouse that does not work after installation, you might have to select another mouse driver. Before 1991, Logitech sold "C-Series" serial mice. Since 1991, Logitech has sold only "M-Series" Microsoft-compatible serial mice. To determine which mouse you have, look at the bottom of the mouse. If it says "CA" or "C7," then it is a C-Series mouse. If not, then you have an M-Series mouse. Use Selective Install to select the correct Logitech mouse driver.

- Logitech Mouse Not Working after Dual Boot from DOS

  If your Logitech mouse is not working on a Dual Boot system after you run DOS and switch to OS/2, your mouse might be running in a mode set by a DOS-based

mouse device driver. To correct the problem if COM2 port is being used, switch back to DOS and type the following at the DOS command prompt:

```
MOUSE PC
```

or

```
MOUSE 2 PC
```

This will reset the mouse to a mode that is recognized by OS/2. You must use the MOUSE.COM that came with the mouse, or the command will not work. Then type the following:

```
C:\OS2\BOOT /OS2
```

OS/2 should start and your mouse should work. If this does not work, disconnect and reconnect the mouse. If these methods do not work, close your programs and turn off the computer. Then, turn the computer on again.

- Three-button mouse not working correctly

  If you have a 3-button mouse and error SYS1201 is displayed on the panel. OS/2 supports only the 2-button mode on a 3-button mouse. If your mouse has a switch to change to a 2-button mode, change the switch. If it doesn't, replace the mouse with a 2 button mouse.

2.11.3.5 CD-ROM Drive-Related Problems

If for some reason your CD-ROM isn't working properly you can try the suggestions provided in this section. The information provided resolves the following problems you might encounter with your CD-ROM.

- Philips CM 205 CD-ROM

  If you have a Philips CM 205 drive and it doesn't work with OS/2, edit your CONFIG.SYS file and change the line containing LMS205.ADD to LMS206.ADD. If your CD-ROM drive is not working correctly (does not respond, or generates errors when trying to read a CD), do the following:

  1. Double-click on **OS/2 System**
  2. Double-click on **Command Prompts**
  3. Double-click on **OS/2 Window**
  4. Insert the Installation Diskette into drive A.
  5. Type the following, pressing Enter after each:

     ```
     COPY A:*.ADD C:\OS2\BOOT
     COPY A:*.IFS C:\OS2\BOOT
     COPY A:*.DMD C:\OS2\BOOT
     ```

     where * represents the actual name of the file.

  6. Edit the C:\CONFIG.SYS file and press Enter (where C is the drive on which OS/2 Warp 4 is installed).

7. Add the following statements to the CONFIG.SYS file (if not already there):

   ```
   IFS=C:\OS2\BOOT\CDFS.IFS /Q
   DEVICE=OS2CDROM.DMD
   BASEDEV=*.ADD
   ```

   where * represents the actual name of the ADD file on the device driver diskette.

8. If the following statement appears in the CONFIG.SYS file, change it from:

   ```
   DEVICE=C:\OS2\BOOT\CDROM.SYS /Q /N:4
   ```

   to

   ```
   REM DEVICE=C:\OS2\BOOT\CDROM.SYS /Q /N:4
   ```

9. Shut down and reboot

- Problems with Sony, Mitsumi, or Hitachi, CD-ROM drives

  If you are using a Sony, Mitsumi, or Hitachi CD-ROM drive and cannot access it, and you have installed OS/2 from CD-ROM, do the following:

  1. Copy the following files from Diskette 1 to the hard disk, as follows:

     ```
     COPY A:\OS2CDROM.DMD C:\OS2\BOOT
     CDPY A:\CDFS.IFS C:\OS2\BOOT
     ```

  2. Edit your CONFIG.SYS file on the hard disk and add the following statements:

     ```
     DEVICE=C:\OS2\BOOT\OS2CDROM.DMD /Q
     IFS=C:\OS2\BOOT\CDFS.IFS /Q
     ```

  3. Shut down the system.

  If you installed OS/2 from diskette, do the following:

  1. Double-click on **OS/2 System**
  2. Double-click on **System Setup**
  3. Double-click on **Install/Remove**
  4. Double-click on **Selective Install**
  5. Click on the **CD-ROM** icon
  6. Click on the name of your CD-ROM device
  7. Click on **OK**

- Problems with Sound Blaster CD-ROM drives

  If you are using a Sound Blaster CD-ROM drive with the device driver SBPCD2.SYS and cannot access the drive, restart your system and do the following:

  1. Copy the following file from Diskette 1 to the hard disk, as follows:

     ```
     COPY A:\CDFS.IFS C:\OS2\BOOT
     ```

2. Edit your CONFIG.SYS file on the hard disk and add the following statement:

   ```
   IFS=C:\OS2\BOOT\CDFS.IFS /Q
   ```

3. Double-click on **OS/2 System**
4. Double-click on **System Setup**
5. Double-click on **Install/Remove**
6. Double-click on **Selective Install**
7. Click on the **CD-ROM Device Support** icon
8. Click on **OTHER** from the bottom of the CD-ROM selection list
9. Click on **OK**
10. When the installation of features is complete, edit the CONFIG.SYS file and delete the following line:

    ```
    DEVICE=C:\OS2\BOOT\OS2CDROM.DMD /Q
    ```

11. Shut down and reboot

2.11.3.6 Hard Disk Related Problems

If your hard disk isn't working properly, you can try the suggestions provided in this section. The information provided resolves the following problems you might encounter with your hard disk:

- Slow SCSI support

  After installation, you might experience slow SCSI support. If this occurs, make sure that the hard disk and the controller card are both set for the same transfer mode, for example, ASYNC or SYNC.

- Hard-disk controller problem

  Determine the controller manufacturer, model number, and type. Then, determine which device driver is installed for the controller (for example, FD7000EX.ADD). Verify that the installed device driver is the correct one. Verify that the BASEDEV= statements are correct in your CONFIG.SYS file. Verify that the correct device driver is listed in a BASEDEV= statement. Also, verify that the device driver is the only device driver listed for that controller. For more information about BASEDEV= statements, refer to the Command Reference in the Information folder.

- Problem with Quantum Hardcard or IDE controller

  Add the required switch properties (adapter number and IRQ level) to the IBM1S506.ADD device driver statement in your CONFIG.SYS file. If you need assistance with the switch properties or need a BIOS upgrade (for certain Quantum Hardcards), contact a service representative at Quantum. Type `Help IBM1S506` for additional information.

- Cannot set up a primary partition

If you have more than two hard disk drives and you cannot set up a primary partition on one of them, your BIOS could be preventing the setup.

With OS/2, you can have a primary partition on two hard disk drives; however, the BIOS in your computer determines which two hard disk drives can have primary partitions.

- Cannot access entire hard disk

  If your hard disk drive has more than 1024 cylinders, and you cannot access the entire drive space, the device driver for your controller might not support more than 1024 cylinders.

  If you have a non-IBM controller and device driver, contact the manufacturer of the device driver to ask if your level of the driver supports more than 1024 cylinders.

2.11.3.7 Desktop-Related Problems

If the Desktop isn't working properly, you can try the suggestions provided in this section. The information provided resolves the following problems you might encounter with the Desktop.

- System stops working

  If the system stops and the keyboard and mouse do not respond, do the following:

  1. Press Ctrl+Esc or Alt+Esc and wait a few seconds to see if the system responds.
  2. Determine if you can move your mouse but cannot select any object when you press mouse button 1.
  3. Press the Caps Lock and Num Lock keys to see if their status lights come on.
  4. Record a description of what you were doing when the system stopped. If any messages were displayed on the panel, be sure to record the message text and number.
  5. Refer to the Service and Support brochure in your OS/2 Warp 4 package for instructions about calling for additional assistance.

- Stacked Icons

  If the objects on your Desktop appear to be stacked, you can refresh your Desktop:

  1. Position the mouse pointer on a blank area of the Desktop
  2. Press mouse button 2
  3. Click on **View**
  4. Click on **Refresh**

  If your panel goes blank, press Alt+Esc to switch between programs and force the "repainting" of your panel.

- Blank desktop and missing objects

If the desktop is blank, objects are missing, you cannot delete an object, or you have another problem that involves objects, run the CHKDSK (check disk) program until the results indicate there are no errors. To run CHKDSK, do the following:

- Insert the OS/2 Warp 4 CD-ROM in the CD-ROM drive
- Boot the system using the OS/2 Warp 4 Installation Diskettes
- Press F3 while in the Welcome panel to exit to the command prompt.
- Change to your CD-ROM drive
- Change to the directory containing the CHKDSK.EXE command
- Type:

```
CHKDSK C: /f:2
```

For more information about CHKDSK, refer to the Command Reference in the Information folder.

- Missing, empty, or multiple objects on desktop

  If any the following symptoms are experienced with your desktop:

  - The desktop has missing objects or there are more than one icon for the same object.
  - One or more desktop folders are empty.
  - After you shut down the computer and start it again, the objects on the desktop are not displayed the same as when you shut down.

  Use one of the following two methods:

  - Recovering archived system files

    If you selected **Create archive at each system restart** on the Archive page of the Properties notebook, you can use an archived set of system files if your current set is damaged. If restoring an archived set of system files does not solve the problem, use the following procedure to restore the original system files.

  - Re-creating system files

    If your Desktop is damaged and recovering the original system files didn't help, you must re-create the INI files. Follow this following procedure to create the OS2.INI and OS2SYS.INI files:

    1. Double-click on **OS/2 System**
    2. Double-click on **Command Prompts**
    3. Double-click on **OS/2 Window**
    4. Type `cd\os2`
    5. Type `attrib -s -h -r os2*.ini`
    6. Type `del os2*.ini`
    7. Type `makeini os2.ini ini.rc makeini os2sys.ini inisys.rc`

8. Shut down and reboot

- Object cannot be deleted

  If you cannot delete an object, do the following:

  1. Create a folder.
  2. Drag the object you want to delete to the new folder and drop it.
  3. Drag the new folder to the shredder and drop it.

  If you cannot shred the folder, do the following:

  1. Open an OS/2 Command prompt
  2. Type `CD\DESKTOP`
  3. Type `RD\<directory>`

  Where `<directory>` is the name of the directory (folder) that you want to delete.

- DOS and Windows programs not added to the desktop

  During the installation of OS/2 Warp 4, your existing DOS and Windows programs are automatically added to your OS/2 Desktop. However, the installation program might not find all programs (for example, programs located on remote servers). If this happens, restart the system, then run the Add Programs to Desktop utility program. (Add Programs to Desktop is located in the System Setup folder which is located in the OS/2 System folder.)

- OS/2 2.x program not added to the desktop

  If you installed OS/2 Warp 4 on a system that already had OS/2 2.x installed on it and your OS/2 2.x programs were not added to your Desktop, do the following:

  1. Turn on the computer. If the computer is already on, press Ctrl+Alt+Del to restart it.
  2. When a small white box appears in the upper left-hand corner of your panel, press Alt+F1.
  3. When the Recovery Choices panel appears, press F2.
  4. Delete the DESKTOP directory.
  5. Press Ctrl+Alt+Del to restart your system. The Desktop should be re-created.
  6. If the problem continues, re-create the INI files.

  If you moved program groups off the desktop and into a folder, you should move them back on the desktop before installing OS/2 Warp 4. Otherwise, duplicate icons could appear on the panel. If you try to delete these icons, the original icons will also be deleted.

2.11.3.8 The AskPSP Utility

One means to problem resolution is to use AskPSP, a new expert system that allows users to obtain answers concerning OS/2 Warp 4 and IBM server products. You can use AskPSP as your own personal help desk.

- On the Desktop, open the **AskPSP** icon.
- Open the OS/2 Warp Case Base icon. This icon loads CasePoint and the OS/2 Warp case base, which is an organized database of support information.
- In the Description area of the CasePoint panel, type `How to use CasePoint` and then press Enter. This initiates a search of the case base.
- Once the search is complete, open the first entry under the Action area of the panel. This brings up an online information unit that describes how to use CasePoint.
- You can browse, search, or print this file as needed.
- To exit from this file, click on the top left corner of its window.
- Do one of the following to clear the information from the panel before you begin a new search:
  - Press Ctrl + N
  - Select the **Red Eraser** icon
  - Select **New Search** from the Search pull-down menu.
- The information is cleared from the panel, and you can type a problem description or question.

Chapter 3. OS/2 Warp 4 Desktop

The OS/2 Warp 4 desktop provides the user with a powerful, customizable working environment. This desktop interface is known as the Workplace Shell. All operations within the Workplace Shell can be performed by a mouse or a keyboard action.

The default OS/2 Warp 4 Desktop features the OS/2 Warp "wave" logo against a textured blue background. At the top of the screen is the WarpCenter tool bar, which provides point and click access to the desktop and critical system functions. See 3.2, "WarpCenter and the Tool Bar" on page 159 for detailed information on using the WarpCenter.

Along the left side of the screen are icon objects that organize the system into four functional groups. These are:

1. **The OS/2 System icon.** This contains all the system objects, configuration, install and remove objects, and system setup objects that are associated with the operating system. Some of the items in the System folder, such as the Drives folder and the Problem Determination Tools folder, are shadowed under other folders. See 3.5, "Workplace Shell Custom Settings" on page 199 for detailed information on the OS/2 System folder.
2. **The Assistance Center icon.** This contains all online information, Readme files, troubleshooting information, the tutorial, and links to information on the World Wide Web. See Chapter 10, "Recovery" on page 773 for detailed information on the Assistance Center.
3. **The Connections folder.** This contains Drives, Printers, and Network folders, as well as links to a wide variety of WWW sites. See Chapter 12, "Additional Applications and Utilities" on page 829 for detailed information on the Connections folder.
4. **The Programs folder.** This contains folders for applications, utilities, WIN-OS/2 programs, and other software applications that are installed on a system.

In addition to providing these four folders into which all program objects can be located, the Desktop provides easy access to the Internet and the World Wide Web (WWW). Internet access is provided through the WebExplorer and a WWW link from which you can download Netscape Navigator for OS/2. See 5.10, "TCP/IP Support in OS/2 Warp 4" on page 537 for detailed information on connections to the Internet.

Finally, drag-and-drop deletion is provided by the shredder icon in the lower right hand corner of the screen. See 3.3.10, "Deleting Objects" on page 181 for detailed information on the shredder.

Figure 53 on page 156 shows the Workplace Shell interface, known as the *OS/2 Warp 4 Desktop.*

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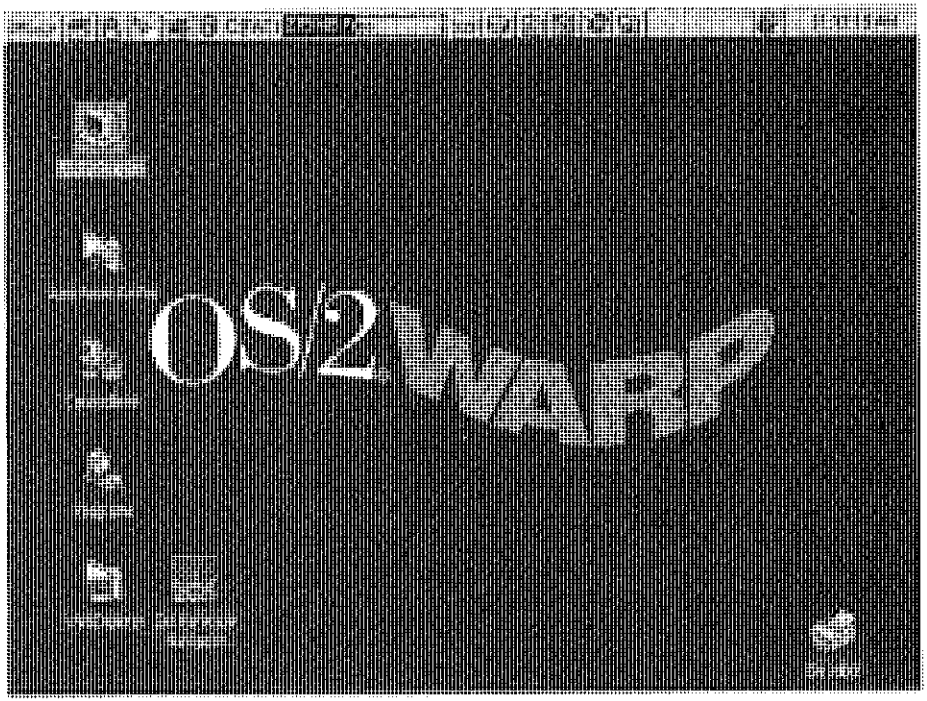


Figure 53. OS/2 Warp Workplace Shell - Post Installation

3.1 Workplace Shell

The new cleaner more logical desktop interface provides:

- Objects, which represent items such as programs and data files, or devices such as disk drives and printers
- A fully customizable tool bar called WarpCenter
- A new array of customizable bitmaps and backgrounds
- Integrated voice control of all desktop functions

The Workplace Shell contains a number of standard objects after the initial install, such as the OS/2 System folder, Assistance Center folder, WarpCenter, etc. These allow the user access to all of the features and functions installed within OS/2 Warp 4.

Objects located on the desktop can be moved, dragged, or deleted. However, if an object is *Locked in Place*, it can not be moved, or dragged. For this reason, you may

want to lock in place the default desktop objects and any other objects you wish to remain on the desktop.

3.1.1 Using a Mouse

Mouse operation is generally consistent within OS/2 Warp 4:

- A single click with the left mouse button selects objects.
- A single click and hold with left mouse button while moving over multiple objects will select them.
- A double click with the left mouse button opens or starts objects.
- A single click with the right mouse button on an object or object background will display the context menu.
- A single click and hold with the right mouse button is used to drag, and releasing the right mouse button will drop.

Some applications may alter the usage in the above list.

3.1.2 Selecting Objects

To select an object, point with the mouse and click with the left mouse button. The border surrounding the object's icon will change, showing that the object is now selected. The context menu can now be used to work with the object or to perform a drag-and-drop operation on it.

Objects can be worked on one at a time, or in an entire group. To select multiple objects, you can use one of three methods:

- Press and hold down the left mouse button while selecting the first object. Keeping the left mouse button down, drag the mouse over the other objects in turn. The border surrounding each object will change to indicate that the object is selected.
- Marquee selection performed by drawing an elastic box around a group of objects by holding down the left mouse button starting on some vacant background, then dragging the mouse until the elastic box encloses the required objects. Release the left mouse button, and the objects will be selected and their borders will change to indicate this.
- Press and hold down the Ctrl key and click the left mouse button on each of the required objects in turn.

With multiple objects selected, drag-and-drop operations can be performed on them. For example, deleting multiple objects from your OS/2 Warp 4 system by selecting them, then dragging and dropping them on the Shredder object.

3.1.3 Opening and Closing Objects

To open an object, double-click the left mouse button on its icon. OS/2 Warp 4 will display a window containing the object's contents, similar to that shown in Figure 61 on page 171.

To close an object, either double-click the left mouse button on the **Open/Close** button shown in Figure 61 on page 171, or single-click the left mouse button on the **Close** button that is also shown in Figure 61 on page 171.

To Avoid a Cluttered Desktop

In many cases objects (particularly folder objects) are nested one within the other. Opening many such objects will cause the desktop to become cluttered, making it difficult to find the window that you want. To avoid this problem, hold down the Shift key while opening objects. This will cause the previous object to close automatically, as soon as the new object opens.

3.1.4 Dragging and Dropping Objects

When using the Workplace Shell, tasks will often be performed on objects by selecting an icon with the left mouse button, then pressing and holding down the right mouse button while dragging the icon over another icon. Then releasing the right mouse button to drop the first icon on the second. For obvious reasons, this is known as a *drag and drop.* interface.

Dragging and dropping objects can have one of several effects:

- Moving an object will cause the object to be relocated to the target location. In this way, an object can be moved from one folder to another. In most cases, this is the default action performed when dragging and dropping an icon.
- Pressing and holding down the Ctrl key while dragging an icon from one location to another will copy an object, rather than move it. The original object will remain unchanged.

  In most cases, the default action when dragging and dropping an object between locations is to move the object. However, OS/2 Warp 4 will always copy an object when you drag and drop an icon to a networked location such as a LAN-attached drive object.

  During a copy operation, the object's icon and the mouse pointer will be shaded, to give a visual indication that a copy operation is being performed.
- Pressing and holding down the Ctrl and Shift keys while dragging and dropping an object creates a shadow of that object. A shadow is an object that points to another object somewhere in the Workplace Shell. A shadow is similar to a copy of the original object, but any changes you make to the shadow are automatically reflected in the original, and vice versa.

The default operation when dragging and dropping objects to the Workplace Shell desktop is create a shadow. You can change this, however, by altering the Properties of the desktop.

Note that creating a shadow is also the default operation when you drag and drop an icon representing an executable file (that is, a file containing a program). OS/2 Warp 4 tries to leave all executable files in their original locations, since many software packages require their executable files and dynamic link libraries to reside in a particular location on the hard disk.

When creating a shadow, the icon and the mouse pointer will display a line joining the parent object to the shadow. This line indicates that a shadow is being created, and will disappear after the object is dropped at the target location.

Objects can also be dragged and dropped onto other objects. For example, a data file object can be dropped onto a printer object, causing the file to be printed, or onto a program object, which will cause OS/2 Warp 4 to start the program and load the file.

There are some times when a mouse may not be available. In these cases, a drag and drop operation can still be performed by using the Pickup menu item in an object's context menu.

3.2 WarpCenter and the Tool Bar

OS/2 Warp 4 has two special objects that assist you in using the Workplace Shell by making it easier to find the objects and information that are used most frequently. These objects are the WarpCenter and tool bar. These can be used separately or both at the same time.

3.2.1 WarpCenter

WarpCenter provides you with a place to store frequently used program objects, which can be started with a single click of your left mouse button. The desktop and other folders can be explored using cascading menus rather than opening each folder individually.

WarpCenter is automatically installed when OS/2 Warp 4 is installed and by default, will start automatically when you boot your system. If you close down WarpCenter and wish to restart it, open the OS/2 System folder where you will see the WarpCenter icon.

By default, WarpCenter displays a window at the top of your Workplace Shell desktop, as shown in Figure 54 on page 160.

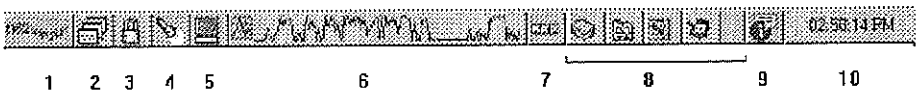


Figure 54. WarpCenter

Field 1 Start Application or open object

Field 2 Window List used to switch to another application,

Field 3 Initiate OS/2 Lockup

Field 4 Find Objects

Field 5 Initiate OS/2 Shutdown

Field 6 Select System Activity Monitor or Disk Space, or Battery power

Field 7 Select object tray

Field 8 Current object tray (containing the default objects)

Field 9 Assistance Center

Field 10 Time or Data or Timer

Note that the position of the WarpCenter window is configurable; it can be placed at the top or bottom of the Workplace Shell desktop.

Figure 54 shows the WarpCenter window with each field marked. The WarpCenter has ten fields, with the following functions:

- **Field 1 - Start application or open an object.**

  A single click of the left mouse button on this field will display cascading menus for all the objects that are on the desktop.

  Figure 55 on page 161 shows an example of the Connections folder cascaded. You will notice that the Web Sites folder resides within the Connections folder and this folder will further cascade. If you click your right mouse button on the Web Sites folder or any folder object represented in Field 1, the folder will open its default view (for example, an Icon View). If you click *either* mouse button on any program, or on a file object with an association to a program, that program will start.

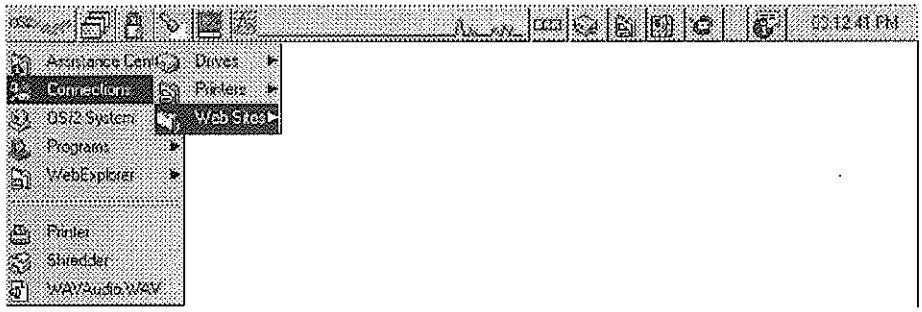


Figure 55. WarpCenter - Field 1

- **Field 2 - Switch to another application.**

  A single click of the left mouse button on this field will display a menu showing all running applications. The menu is similar to Figure 55. A single click of either mouse button on a menu item will display the window associated with that application.

- **Field 3 - Initiate OS/2 Lockup.**

  A single click of your left mouse button on this field will lock your desktop. To configure your OS/2 Warp 4 system to use this feature, use the Properties notebook for the Workplace Shell desktop. If you have not already set a password, you will be prompted for an initial password.

- **Field 4 - Find Objects.**

  A single click with the left mouse button on this field will start the Find Objects facility.

- **Field 5 - Initiate OS/2 Shutdown.**

  A single click with the left mouse button on this field will initiate shutdown. A confirmation will be required to shut down the OS/2 Warp 4 system.

- **Field 6 - Disk Space, System Activity** or **Battery Usage Monitor.**

  This field alternates between the:

  Disk Space Monitor:
  System Activity Monitor
  Battery Usage Monitor
  Mains Usage Monitor

  A single click of the left mouse button will first scroll through a Disk Space Monitor for each of the local drives (this can be configured through WarpCenter's Properties notebook), then the System Activity Monitor and finally the Battery Usage Monitor.

Note that the Battery Usage Monitor is *only* displayed on computers that have the Advanced Power Management feature; this is normally available on laptop computer systems.

- **Field 7 - Select object tray.**

  WarpCenter allows you to have multiple trays on which you can drag and drop objects for easy access. Field 7 allows you to switch between trays, while the current tray itself is displayed in field 8. You can add, rename or delete trays using the WarpCenter context menu.

  A single click of your left mouse button on field **7** will display a cascade menu of all the available trays. Using multiple trays allows you to organize your objects into logical groups. It also allows for more objects, while still giving your easy access with a single click of your left mouse button.

- **Field 8 - Current object tray.**

  You can drag and drop any object onto this area for single click access to your most important applications. If you click on a program object or a file object that is associated with a program, that program will start. If you select a folder object, a cascade menu will be presented. Within the cascade menus, the mouse behaves in the same way as described for field 1.

  If you click your right mouse button on any object in the tray, OS/2 Warp 4 displays the context menu for that object.

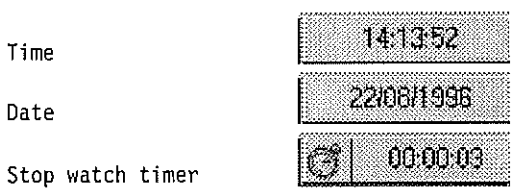
  A single click of your left mouse button on any portion of the tray that does *not* contain any objects will scroll you through all the available trays.

- **Field 9 - Assistance Center.**

  A single click of your left mouse button on this field will display a cascade menu of the Assistance Center folder.

- **Field 10 - Time, Date** or **Timer.**

  This field can display:



You can *start, stop or reset* the timer with a single click of your left mouse button on the stop watch icon on the left-hand side of the timer display.

A single click of your left mouse button on field 10 will scroll you through all three options in turn.

The WarpCenter Properties notebook has a number of setup options that you should consider. For more information on these, see the online help text for WarpCenter.

Notes

If you close the WarpCenter you can restart it by simply double-clicking your left mouse button on any vacant spot on your Workplace Shell desktop.

This ability is controlled by the `SET AUTOSTART=` statement in your OS/2 Warp 4 CONFIG.SYS file, with parameter WARPCENTER. For example:

```
SET AUTOSTART=PROGRAMS,TASKLIST,FOLDERS,WARPCENTER
```

3.2.1.1 WarpCenter Properties

The context menu of WarpCenter is accessed in the same way as all other objects, by clicking on any field with the right mouse button. On field 8, however, this will display the selected object's relative context menu.

The Properties folder can then be opened as shown in Figure 56.

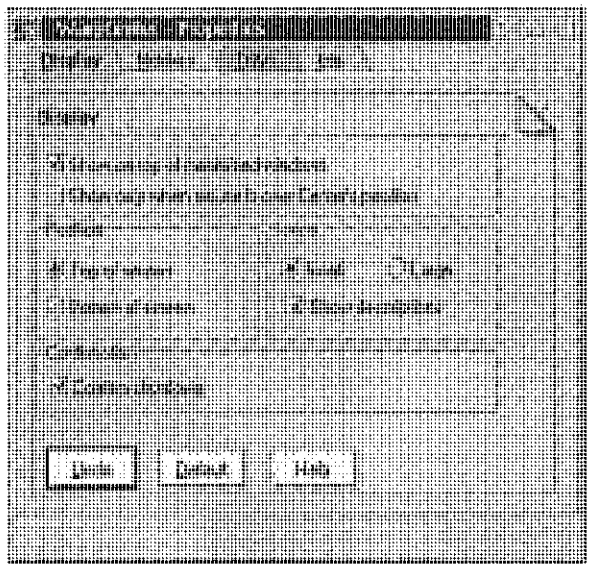


Figure 56. WarpCenter Properties Folder (Display Tag)

Display Tab: The Display page of WarpCenter Properties is used to select how WarpCenter is to be shown on the desktop.

The Display window tab has the following options:

- Checking the Show on top of maximized windows option will keep WarpCenter visible at all times, allowing full access to all desktop objects.
- Checking the Show only when a mouse is over Center's Position option causes WarpCenter to hide during normal desktop and application operation. However, when a function of WarpCenter is required, simply moving the mouse to the top or bottom of the screen where WarpCenter is positioned, will cause it to automatically display.

Position

- Enables WarpCenter to be placed at the top or bottom of the screen as required by the user.

Icons

- The icon setting allows for further customization of the size of the icons displayed on WarpCenter. If running at high resolution, large icons may be required.
- The Show description settings will display the field or icons description when running the mouse over each section of WarpCenter.

Confirmation

- If the **Confirm Shutdown** is selected, OS/2 Warp 4 will provide a prompt to confirm a shutdown request. We recommend that this option always remain set.

Monitor: The Monitors tag controls the displaying of system monitors for field 6 of the WarpCenter.

- Resource Monitor options simply allow the user to turn off display monitoring for each of the items shown in Figure 57 on page 165.

  The Show Battery Usage monitor option will be greyed out if Advanced Power Management (APM) is not available. On a desktop system with APM this does not provide any useful information.

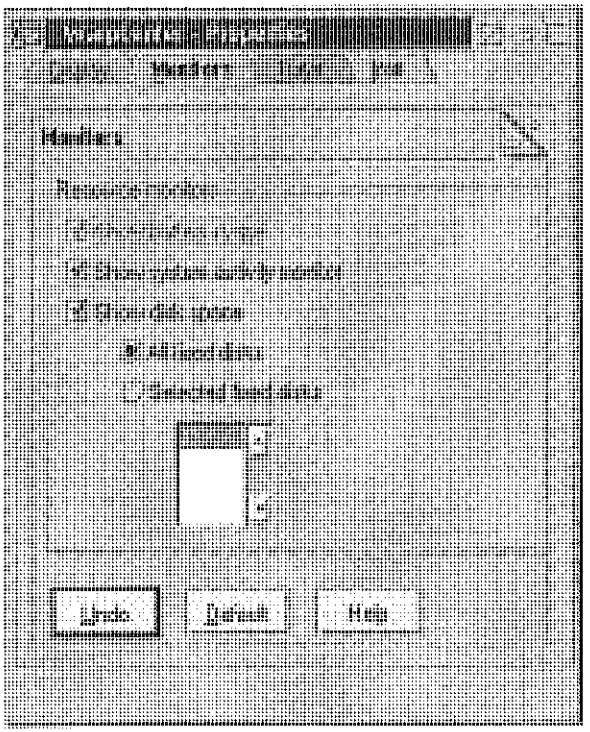


Figure 57. WarpCenter Properties Folder (Monitor Tag)

Trays: The Trays tag is used to put additional WarpCenter trays in field 8. In Figure 58 on page 166, two additional trays have been added for LAN Resources and Applications. These can be deleted or renamed later using the Rename tray and Delete tray buttons.

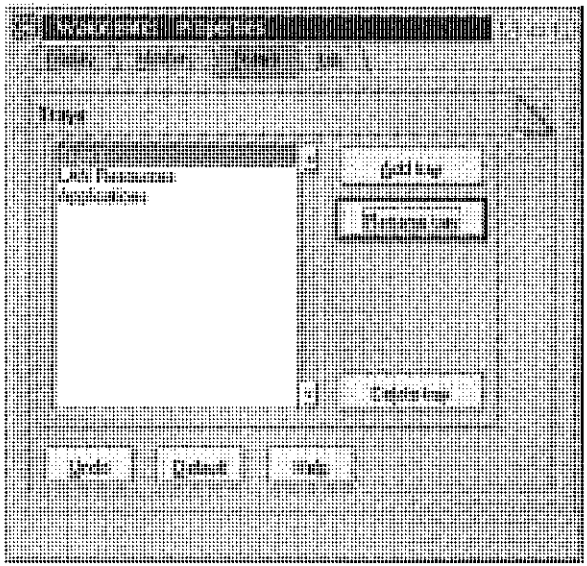


Figure 58. WarpCenter Properties Folder (Tray Tag)

Icon: The Icon tab is a standard tab of any Workplace Shell object. It is used to change the icon or description of the currently selected object.

3.2.1.2 Advanced WarpCenter Function

The WarpCenter has an advanced feature that will allow the displaying of all active processes, and also allow the user to kill a process if it is not responding to system or user commands. Shown in Figure 59 on page 167. are the active processes on a typical network-connected system.

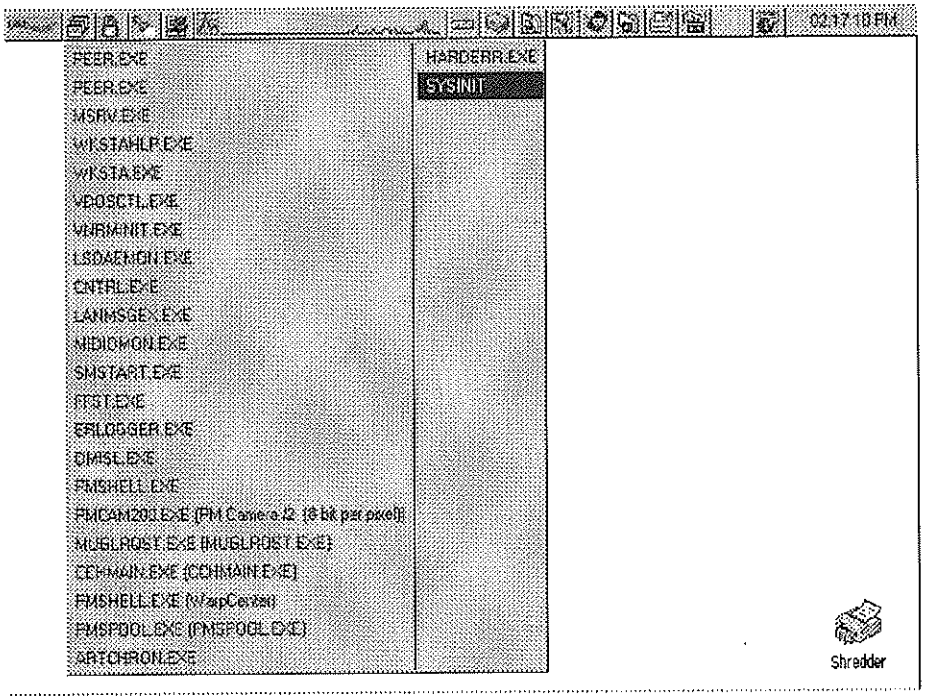


Figure 59. WarpCenter Advanced Settings

To enable this function, you must add a set parameter to your CONFIG.SYS file, as follows:

```
SET SCKILLFEATUREENABLED=1
```

The only space appears after the word SET. Your system must then be restarted for this is take effect.

To access the function, hold down the CTRL key while clicking the left mouse button on the **Window list** icon, that is, field 2, on the WarpCenter. To kill a listed process, simply click on it, and select **Yes** for the WarpCenter confirmation.

Note!

This function should only be used to kill a process that is known to be hung. If you attempt to kill processes for which you do not know the function, you may cause your system to freeze.

3.2.2 Tool Bar

The tool bar is similar in concept and function to the WarpCenter. Figure 60 shows the tool bar with each area marked.

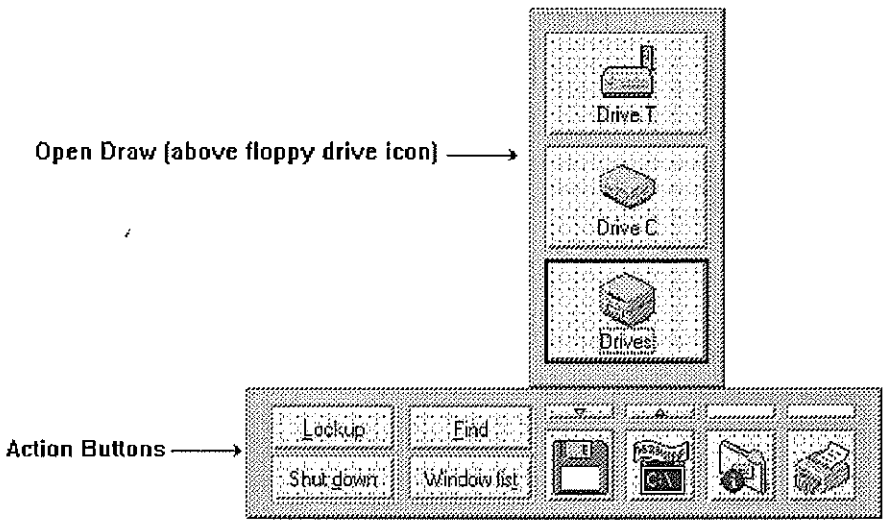


Figure 60. Tool Bar

The tool bar is found in the OS/2 System folder. You can start the tool bar by double-clicking your left mouse button on its icon.

The tool bar displays some icons directly on the tool bar window, and holds other icons in drawers that you can open by clicking on the narrow button (the one that contains an upward-pointing arrow) above each icon. The drawer will open as shown in Figure 60 and display the icons that it contains.

To open an object from the tool bar, simply click your left mouse button on the corresponding icon. When you want to access an icon in a drawer, first click on the narrow icon to open the drawer, then click on the icon. You can also drag and drop objects onto icons in the tool bar.

You can add objects to the tool bar if you wish. To do this, simply drag and drop the object onto a vacant section of the tool bar (this normally means one of the spaces between the icons already in the tool bar). The tool bar will expand to add the icon, and a narrow button will appear above the icon, although initially this button will not contain an upward pointing arrow.

To add an object to a drawer, drag and drop the object onto the narrow button that corresponds to the drawer in which you want to place the object. The object will automatically be added to the drawer. Note that you can create your own drawers by dropping an object on the narrow button above an icon that you have added to the tool bar window. The narrow button, which initially does not contain an arrow, will then change to include an arrow, indicating that there are one or more icons in the drawer.

To remove an object from the tool bar, simply drag and drop it on the shredder icon in the tool bar window.

The tool bar contains four *action buttons* in addition to the icons used to open objects, as shown in Figure 60. To perform any of these actions, just click your left mouse button on the corresponding button.

As with all Workplace Shell objects, the tool bar has its own Properties notebook. This notebook allows you to alter the appearance of the tool bar window and the icons within it. We recommend that you experiment with the tool bar Properties notebook to find the settings that best suit you.

If you wish, you can have several tool bars running at the same time, each with its own set of icons. For example, you might have one tool bar that you use only for word processing tasks, or another that you use only for application development. If you combine this capability with work area folders (see 3.4.1, "Folders" on page 190), you can customize your Workplace Shell to suit the task you are performing at the time. To use multiple tool bars, just make a copy of the tool bar object and start it, then add or delete icons as you wish.

Note

If you close the tool bar, you can restart it by double-clicking your left mouse button on any vacant spot on the Workplace Shell desktop, provided that you add the TOOLBAR parameter to the SET AUTOSTART= statement in your OS/2 Warp 4 CONFIG.SYS file, as shown in the following example:

```
SET AUTOSTART=PROGRAMS,TASKLIST,FOLDERS,WARPCENTER,TOOLBAR
```

3.3 Desktop Objects and Icons

Each object on the OS/2 desktop is represented by an *icon*. An icon is simply a visual representation of the object, with a description indicating the object's purpose.

In Figure 53 on page 156, everything you see on the Workplace Shell has a corresponding file or directory associated with it, thus becoming an *Object*.

3.3.1 Opening an Object

To display the contents of an object, you must *open* the object. This is done by pointing on the object with the mouse, and double-clicking with the left mouse button. If the object is a folder, OS/2 Warp will display a window containing the contents of the folder. If it is a program, OS/2 Warp will start the program.

The Workplace Shell also allows objects to be related to one another; this is called *association*. Associating objects with one another tells OS/2 Warp how to handle certain types *of* objects. The default operation is to *o*pen the object. When a data file object is opened, the process becomes a little more complex, as data objects can be created by any number of programs. Associating data file objects with program objects solves this problem, and allows OS/2 Warp to determine what program it should use to display the contents of the file.

Many of these associations are already done when OS/2 Warp is installed. Others can be added when required.

3.3.2 Common Object Features

All objects in OS/2 Warp, regardless of whether they represent programs, data files, devices or other items, have certain common features. This consistent appearance and behavior makes objects easier to use. Figure 61 on page 171 shows an open folder object with the major standard functions identified.

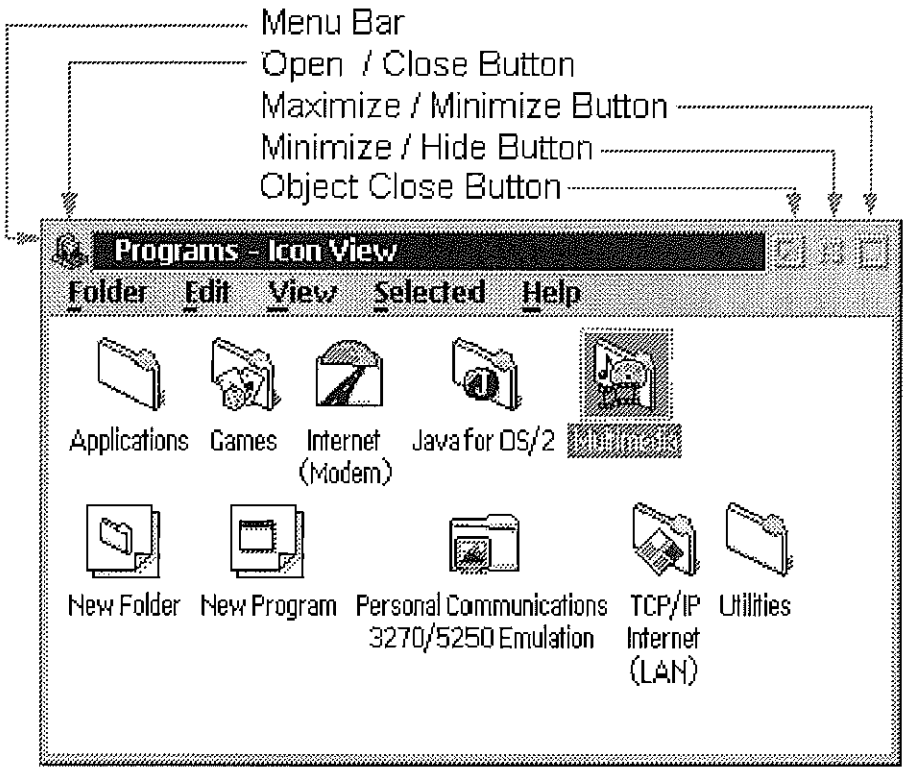


Figure 61. Open Workplace Shell Folder Object

3.3.3 Context Menus

Clicking on a Workplace Shell object using the right mouse button displays a *context menu* for the object, as shown in Figure 62 on page 172.

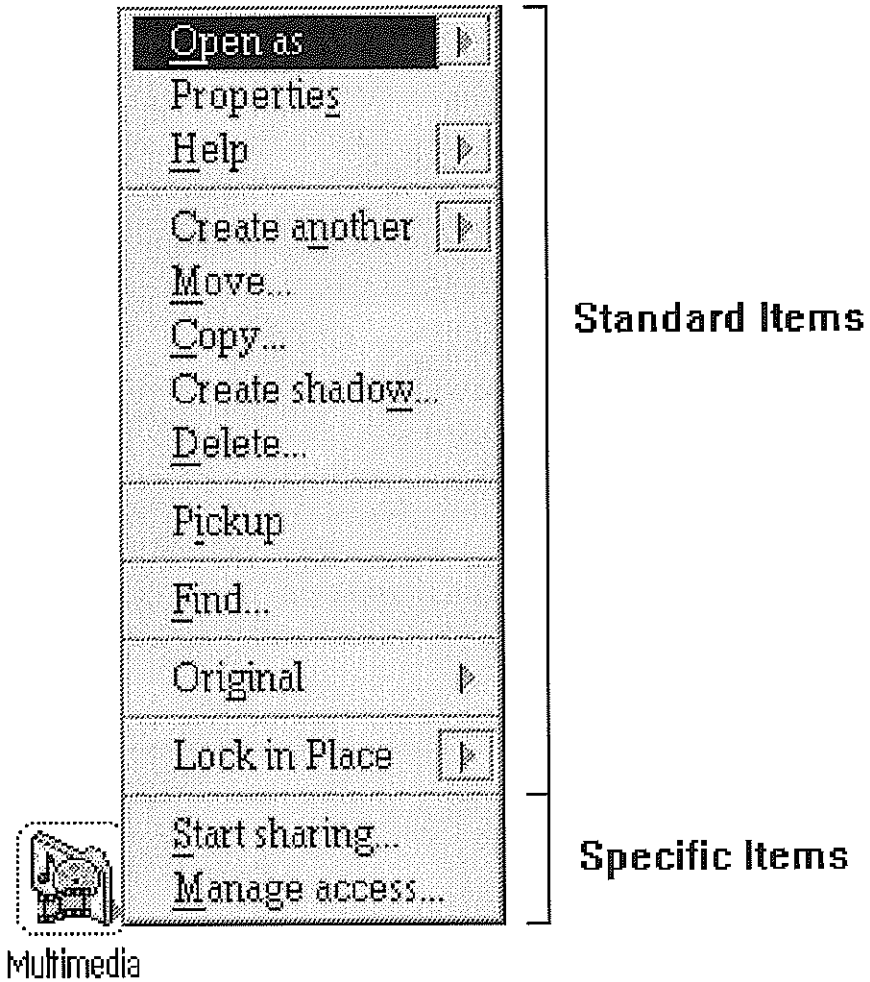


Figure 62. Folder Context Menu (LAN-Connected)

Every object has its own context menu, which contains many standard items for each class of object, plus some specific items that may only appear at certain times. The example in Figure 62 shows the context menu for a folder when you are connected to a LAN and logged on as a LAN administrator. The Standard Items shown in Figure 62 are those that are seen if there was no network connection, or the PC was not logged onto the LAN. After a network logon, OS/2 Warp 4 extends the context menu with the Specific Items that allow you to manage the folder as a network resource.

A different example (shown in Figure 63 on page 173) shows the context menu for the Workplace Shell Desktop.

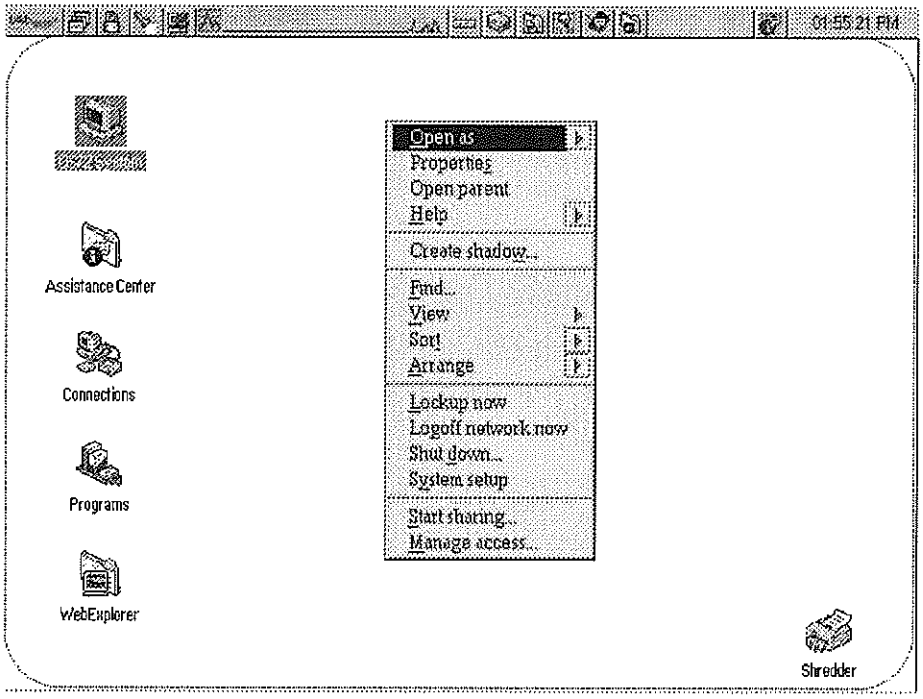


Figure 63. Workplace Shell Desktop - Context Menu

The Desktop context menu varies from an object menu. It lacks the Lock in Place option, as the desktop itself does not move, but includes several additional options such as:

- Lockup Now
- Shut down
- System setup

Note

Always examine the context menu for any object before opening.

3.3.4 Object Views

When viewing the context menu for certain object classes, for example a folder, the menu option Open as appears. Some object classes can be opened in several ways; these different ways are known as views. For example, a folder object has three views:

- Icon View
- Tree View
- Details View

The different views display the same information. However, the level of detail varies. The default view for normal folder object is the icon view, as shown in Figure 64.

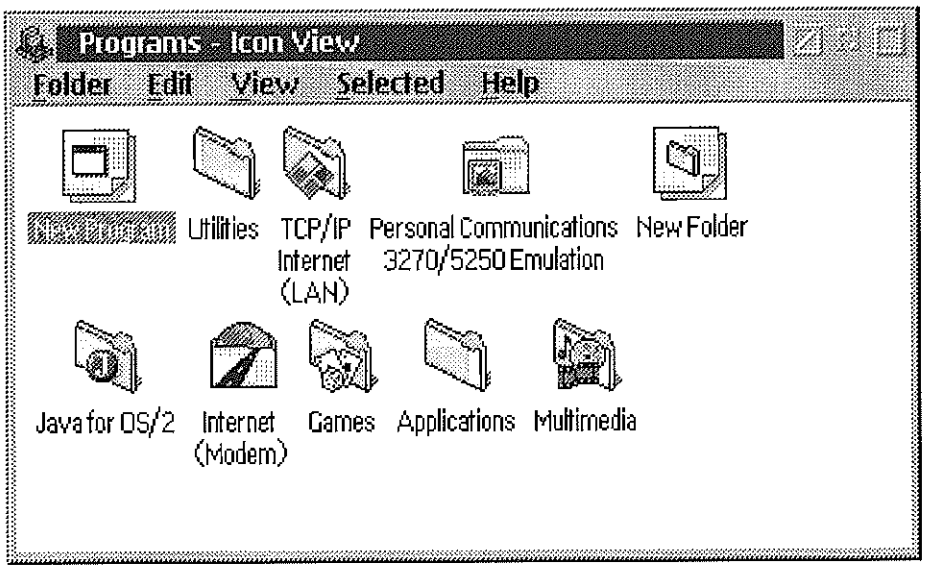


Figure 64. Icon View

The Icon View shows a folder as a container, which holds other objects such as programs, data files or other folders.

A folder represents a directory on a PC's hard disk. A Tree View allows the viewing of an entire structure of subdirectories within a folder, as shown in Figure 65 on page 175.

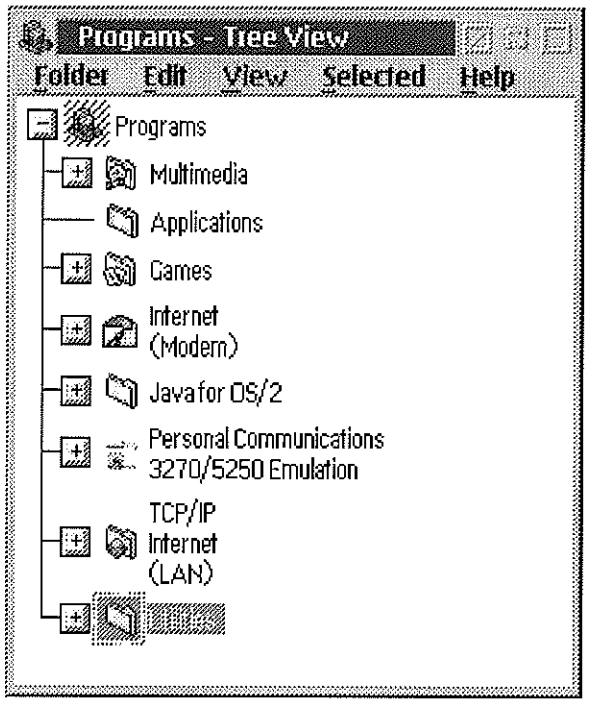


Figure 65. Tree View

The remaining view of a folder object is the Details View. This view provides detailed information about the objects within a folder, such as the date and time they were created and last accessed, their size (for example, data files, etc.). The Details View is shown in Figure 66 on page 176.

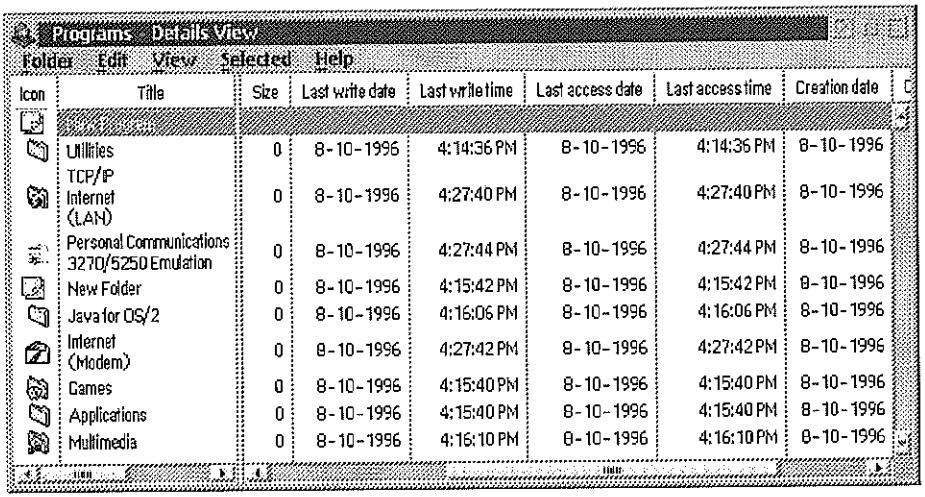


Figure 66. Details View (Subset of Details View)

3.3.5 Automatically Opening Objects

When OS/2 Warp 4 boots, the Workplace Shell opens any objects that were open at the last shutdown of the system. This means that any folders, files or program objects will open automatically, and the desktop will appear the same as when the Shutdown command was issued.

In some cases, you may not want the Workplace Shell to automatically open the same set of objects you opened last time. If so, you can turn off the automatic opening feature by placing the following statement in your OS/2 Warp 4 CONFIG.SYS file:

```
SET RESTARTOBJECTS=NO
```

This statement can be placed anywhere in the CONFIG.SYS file.

There are two other ways to automatically start programs or Workplace Shell objects in your OS/2 Warp 4 system. These are:

- The STARTUP.CMD file
- The Startup folder

Each of these methods works in a slightly different way. The following sections explain when and how to use each.

3.3.5.1 STARTUP.CMD

The STARTUP.CMD file is a command file, similar in function to the AUTOEXEC.BAT file in a DOS or Windows system. The STARTUP.CMD file contains commands that are

executed automatically by OS/2 Warp 4 each time the system boots. OS/2 Warp 4 places some commands in this file during installation (for example, the command to automatically start the File and Print Client is located there).

Note that commands entered in the STARTUP.CMD file are independent of the Workplace Shell. These commands are always executed, regardless of the SET RESTARTOBJECTS statement in the OS/2 Warp 4 CONFIG.SYS file.

The STARTUP.CMD file is most useful when commands need to be issued at boot time, but these programs don't appear on your desktop. For example, the NET START command starts the File and Print Client. This command starts the client software running in the background, and there is no need to see it.

3.3.5.2 The Startup Folder

The Startup folder resides within the OS/2 System folder on your desktop. If an object is placed in the Startup folder, OS/2 Warp 4 will automatically open the object when you boot your OS/2 Warp 4 system.

Note that a shadow should be created of the object in the Startup folder, rather than moving or copying the existing object. Using a shadow will ensure that any changes made to the original object are reflected in the Startup folder, and vice versa.

Since the Startup folder is part of the Workplace Shell, objects located in this folder can be affected by the SET RESTARTOBJECTS statement in your OS/2 Warp 4 CONFIG.SYS file. If SET RESTARTOBJECTS=NO, is set, OS/2 Warp 4 will not automatically start objects in the Startup folder. To automatically start objects in the Startup folder, but not start any other objects, use the following statement in your CONFIG.SYS file:

```
SET RESTARTOBJECTS=STARTUPFOLDERSONLY
```

This will ensure that only those objects placed in the Startup folder are started automatically when OS/2 Warp 4 system boots.

3.3.6 Creating a New Object

Many objects are created when OS/2 Warp 4 is installed. Additional objects can be created in one of two ways:

- Use a template from the Templates folder.
- Copy an existing object and modify it to suit your requirements.

The Templates folder contains templates for most of the object classes in OS/2 Warp 4. To open the Templates folder:

1. Double-clicking on the **OS/2 System** icon to open it.
2. Within the OS/2 System folder, open the **Templates** folder.

An example of the Templates folder, as it appears after OS/2 Warp 4 installation, is shown in Figure 67 on page 178.

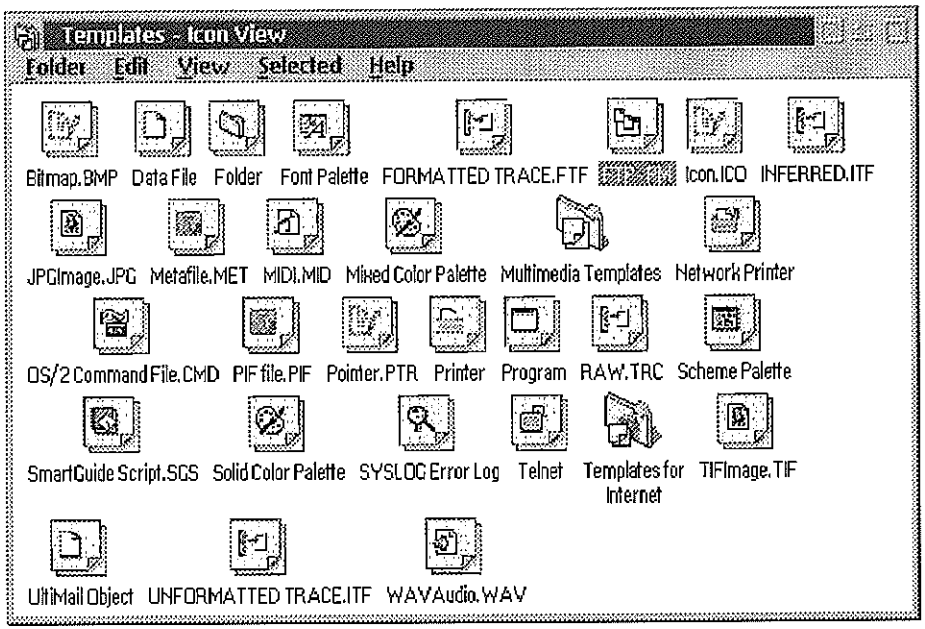


Figure 67. Templates - Icon View

Note that the Templates folder may appear different from the one shown, since some object classes only appear if requested optional features are installed. For example, the Telnet template shown in Figure 67 will not appear if the Internet networking component is not installed.

To create an object from a template, select the template with the mouse and drag it to the location of the new object. OS/2 Warp 4 will automatically create the object for you. In some cases, OS/2 Warp 4 may open a Properties notebook for the object, requesting information that is needed to be entered before using the object.

To create a new template, select the check box **Template** on the first page of the Icon tab. If this box is selected, the object will become a template. This template can then be dragged to another location and used to create new objects that will appear exactly the same as the template.

Relocating Templates

The only way to relocate a template is to move it by dragging and dropping while holding the Shift key down.

3.3.7 Naming and Renaming Objects

Objects can be named or renamed using one of two methods:

1. Press and hold down the Alt key while clicking the left mouse button on the object to be named. An entry field will appear containing the current name of the object. Type the new name into this field. As soon as another object is selected, the entry field will close and the object will appear with the new name.
2. Use the Title field on the Icon page of an object's context menu notebook.

Note two objects in the same folder cannot have the same name. To make this happen (for example, dragging an object from one folder to another folder that already contains an object with the same name), OS/2 Warp 4 will ask whether the existing object should be replaced, or renamed to another object.

3.3.8 Finding Objects

OS/2 Warp 4 provides a Find Objects utility to locate hidden or lost objects stored somewhere within the Workplace Shell. The Find Objects utility can be accessed from the Find menu item in the context menu of the desktop or any folder object. The Find button can be seen in many places throughout the Workplace Shell, such as the Property settings notebooks of many Workplace Shell objects.

Figure 68 shows the Find Objects window.

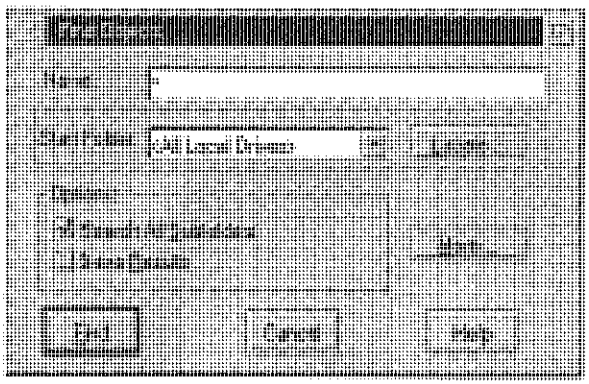


Figure 68. Find Objects Utility

This windows is used to search for objects that are located on the desktop or a particular drive. Use the Name field to specify the object you want to find, then use the Start Folder field or select **Locate** to specify the location where you want to begin the search.

The Search All Subfolders check box searches all the subfolders of a particular drive, rather than just the root directory of that drive.

Select the **Save Results** check box to create a folder that contains shadows of the objects found. Each time this option is selected, OS/2 Warp 4 creates a new folder with the Find results stored within a new folder.

A simply way to access this utility is via WarpCenter. The Find function is shown by a Flash Light or Torch icon.

> **Note:**
>
> If you do not select the **Save Results** check, OS/2 Warp 4 creates a folder that contains the *actual* objects found. If you delete an object in this window, you will be deleting the *original* object from your system.

To specify additional search criteria for the Find Objects utility, select the **More...** push button. This allows the search criteria to be narrowed down using attributes.

Select the **Find** button to start searching. If the search was unsuccessful, a message is displayed informing you that no objects matching the specified criteria were found.

When the Find Objects utility has completed its search, the found objects can be dragged to whatever location is required.

3.3.9 Finding an Open Object

When an object such as program or data file is open, its window may be visible on the Workplace Shell desktop, but it may be hidden behind other windows or minimized and therefore not visible. OS/2 Warp 4 provides a number of ways to locate a window and bring it in the foreground so that it can be worked with.

3.3.9.1 Window List

The Window List is a list of tasks currently running in your OS/2 Warp 4 system. To display the Window List, press and hold down the Ctrl key while pressing the Esc key. OS/2 Warp 4 will display the Window List.

The Window List can also be accessed from WarpCenter. It is shown by cascading windows in the second position of WarpCenter.

To jump to a window from the Window List, simply double-click the left mouse button on the corresponding list entry. The context menu can also displayed for the window by clicking the right mouse button on its entry in the list.

Note that the Window List may not display all of the tasks currently running in the OS/2 Warp 4 system. Some tasks such as networking programs may run in the background once they are started, and will not include themselves in the Window List.

You can jump to each entry in the Window List in turn, by pressing and holding down the Alt key while repeatedly pressing the Esc key. However, this normally takes longer

than using the Ctrl+Esc method, and we recommend using Ctrl+Esc in most circumstances.

3.3.9.2 Alt+Tab

The Alt+Tab switch allows quick access to any open windows that are hidden under other windows. Hold down the Alt key and then press the Tab key. In the center of the Workplace Shell desktop, a window will appear containing the name of the window that had focus just before the current window. Pressing the Tab key again, the name in the window will change to that of the window that previously had the focus, and so on. When you find the window you want, release the Alt key and that window will come to the foreground.

Note that the ALT+Tab key function will *only* scroll through those windows that are open on the desktop. It does not show minimized windows. To find these, you can use Ctrl+Esc to display the Window List, and select the window you want from that list.

3.3.10 Deleting Objects

Some objects that are deleted may not be able to be recovered. The following are two ways to delete an object:

- Drag the object and place it on the Shredder object
- Click on **Delete** from the object's Context menu with the right button.

Once this process is invoked a Delete Object(s) window appears as shown in Figure 69.

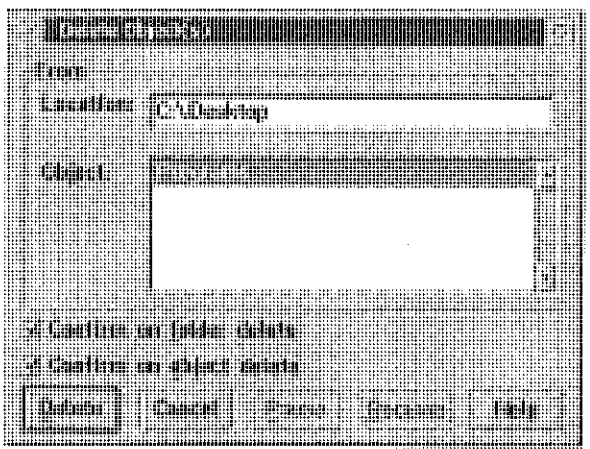


Figure 69. Delete Object(s) Confirmation Window

If both confirmation boxes are checked, every object inside the folder will be subject to confirmation before deletion. Deselecting the confirmation check boxes removes this verification check by the user.

This confirmation settings can be set in the System Properties folder, using the Confirmations tag. See 3.5, "Workplace Shell Custom Settings" on page 199.

3.3.11 Sorting and Arranging Objects

The Workplace Shell desktop and other objects allow the sorting and arranging of objects in a number of ways. Sort and Arrange options are available in the context menus, and on the menu bar for folders, in the View pull-down menu.

The default sort method for this desktop is by name, when just selecting **Sort**.

3.3.11.1 Sorting

The objects on the desktop or in a folder can be sorted in any of seven ways:

- Sort by **Name**.

  This is the object name as seen beneath the object's icon.

- Sort by **Type**.

  This is the type of object; for example, Program.

- Sort by **Real Name**.

  This is the name of the object as it known to the file system. The object name can be different from the name in the file system; for example, the name in the file system (if you were to do a DIR command from a command line) might be WORK.TXT, whereas the file object representing this file might be named MY WORK. The real name is WORK.TXT.

- Sort by **Size**.

  This is the amount of space that an object occupies on your hard disk.

- Sort by **Last write date**.

  This is the last date that the object was updated.

- Sort by **Last access date**.

  This is the last date the object was used; for example, program objects are used quite often, though rarely updated.

- Sort by **Creation date**.

  This is the date the object came into existence.

The Properties notebook for the desktop and folder objects includes a Sort tab. Here you can set:

- **Default sort attribute** from the list above.

- **Always maintain sort order**. Selecting this check box causes OS/2 Warp 4 to sort the objects in the folder whenever an object is added or deleted. It has the additional effect of always arranging the objects in the Standard layout, even if the folder's window is resized, or when objects are added or removed.
- Restricting the available sort options by object type (as per the list above).

The default sort order for any new folder created can be permanently altered, by opening the Properties notebook for the Folder template in the Templates folder, and make the changes there. From that time on, any new folders created from that template will have the new default sort order.

3.3.11.2 Arranging

There are eight ways to arrange the Workplace Shell desktop objects. They are:

- **Standard**

  Figure 70 shows the Standard layout. This is the default.

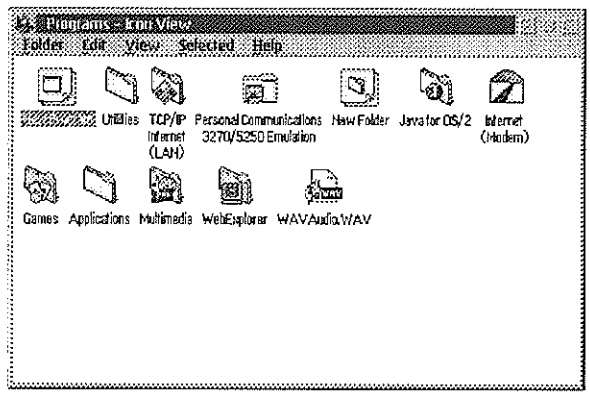


Figure 70. Arranging the Desktop - Standard

  Select this layout to arrange the objects into rows.

- **From Top**

  Figure 71 on page 184 shows the From Top layout.

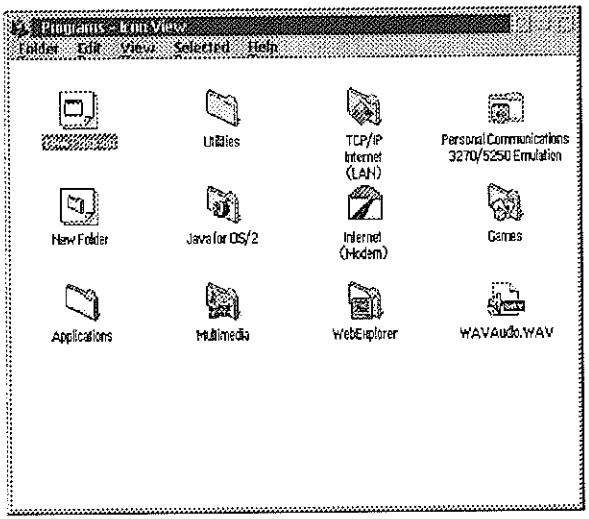


Figure 71. Arranging the Desktop - from Top

Select this layout to arrange the objects in equal distance from the top of the window. When the top of the window has been filled with objects, a second row will be started.

- **From Left**.

  Figure 72 on page 185 shows the From Left layout.

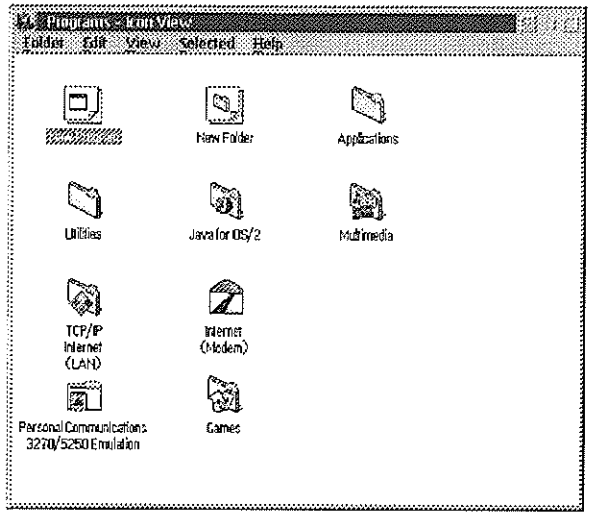


Figure 72. Arranging the Desktop - from Left

Select this layout to arrange the objects in equal distance from the left-hand side of the window. When the left-hand side has been filled with objects, a second column will be started.

- **From Right**

  Figure 73 on page 186 shows the From Right layout.

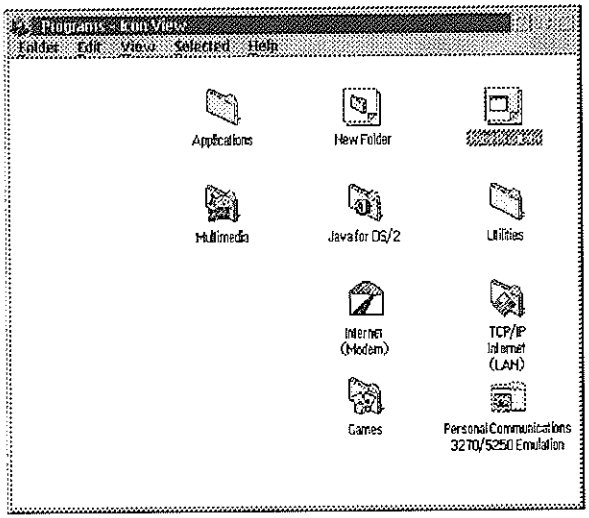


Figure 73. Arranging the Desktop - from Right

Select this layout to arrange your objects in equal distance from the right-hand side of the window. When the right-hand side of the window has been filled with objects, a second column will be started.

- **From Bottom**

  Figure 74 on page 187 shows the From Bottom layout.

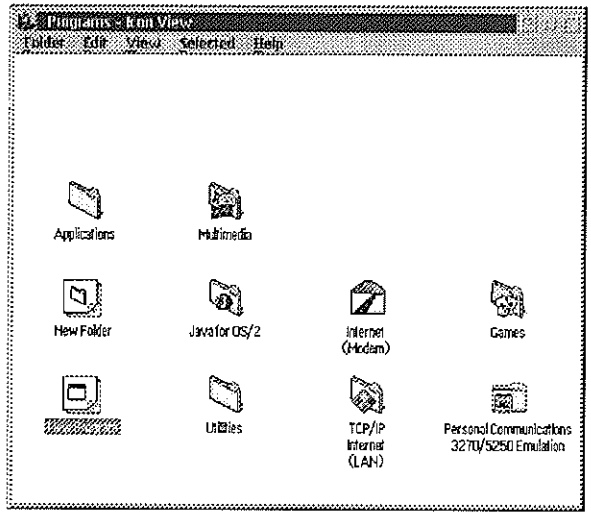


Figure 74. Arranging the Desktop - from Bottom

Select this layout to arrange the objects in equal distance from the bottom of the window. When the bottom of the window has been filled with objects, a second row will be started.

- **Perimeter**

  Figure 75 on page 188 shows the Perimeter layout.

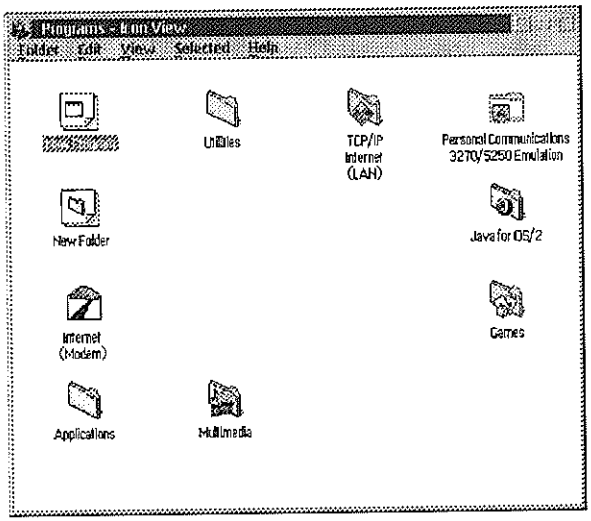


Figure 75. Arranging the Desktop - Perimeter

Select this layout to arrange your objects around the outside of the window.

- **Selected Horizontal**

  Figure 76 shows the Selected Horizontal layout.

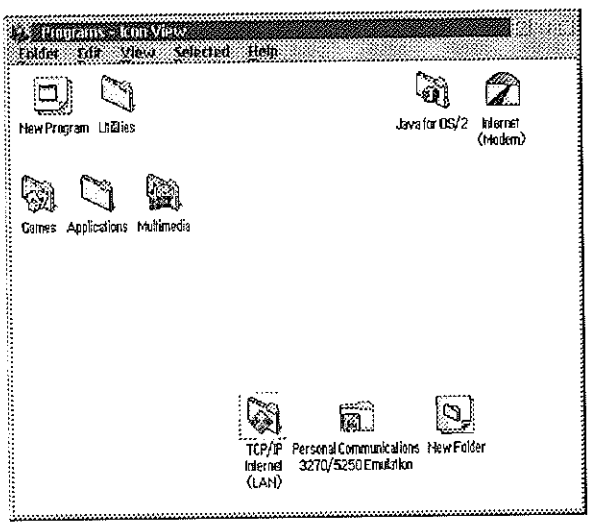


Figure 76. Arranging the Desktop - Selected Horizontal

This option, along with the Selected Vertical layout, allows you to arrange a selected set of objects in a different manner from other objects in the folder. For example, starting with the *Standard* layout shown in Figure 70 on page 183, three objects were selected. *Only* these selected objects were then arranged horizontally.

- **Selected Vertical.**

  Figure 77 shows the Selected Vertical layout.

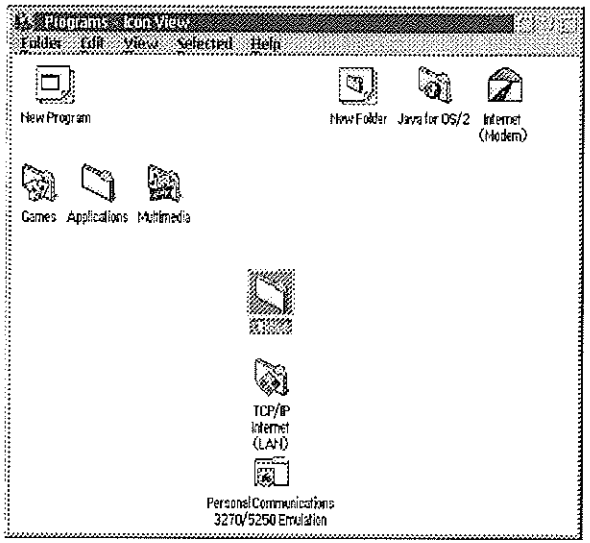


Figure 77. Arranging the Desktop - Selected Vertical

This layout is similar to the Selected Horizontal layout, in that it allows you to arrange a selected group of objects in a different manner from the other objects in a folder. For example, starting with the Standard layout shown in Figure 70 on page 183, three objects were selected. *Only* these selected objects were then arranged vertically.

Note that any layout selected will only remain in effect if **Always maintain sort order** is not selected in the Sort tab of the Properties notebook for the folder.

If you arrange your desktop or a folder, and then immediately decide you do not like the way the folder looks, you can undo the arrangement by clicking on the **Undo arrange** menu item that will appear in the context menu. This item also appears in the View pull-down menu on a folder's menu bar.

3.4 Object Types

There are many classes of Workplace Shell objects in the OS/2 Warp 4 system. The most common classes are described below.

3.4.1 Folders

A folder is an object that acts as a container for other objects such as data files and programs.

A folder can have multiple views:

- Icon
- Tree
- Details

These different types of view are described in 3.3.4, "Object Views" on page 174.

The default view for a folder object is the Icon View; this view is automatically opened whenever a folder object is opened. This default view can be changed, however, by clicking on the **Menu Tab** in the folder's Properties notebook. In the Available menus listbox there is an Open as item. If this is selected, a list of all three view in the Actions on menu: Open as listbox will be displayed. Select the **Properties** push button to display the Menu Properties window in which the Default Action list box will display the Default view. Select the view required as the default. Regardless of the default view, other views can be selected using the folder's context menu or, while the folder is open, by clicking on **View** in the folder's menu bar (see Figure 61 on page 171).

Note!

In the File tab in a folder's Properties notebook, select the **Work Area** check box to designate a special setting for the selected folder. The folder then becomes a special work area folder in which you can place objects that are related to a specific task.

Work area folders have two special features:

- When the folder is closed, all windows belonging to the objects within the folder are closed automatically and the view of each object is saved. When the folder is opened the next time, the windows for the objects in the folder are displayed with their previous view.
- When the window of the folder is hidden, all windows belonging to the objects in the folder are hidden automatically. When you show the work area folder (from the Window List), the windows for the objects in the folder are displayed with their previous view.

If a work area folder is minimized, only the icon for the work area folder is displayed in the Minimized Window Viewer or on the desktop. The windows belonging to the objects in the work area folder are not displayed.

Work area folders function with the Icon or Details View, but not with the Tree View.

3.4.2 Program Object

A Program reference object is a Workplace Shell representation of a program or application that resides on the OS/2 Warp 4 system. A program is started by double-clicking the left mouse button on the program object.

The program object can be used for any executable code such as .EXE, .CMD, .BAT, .COM, etc. files.

OS/2 Warp 4 creates many program objects during installation. If the system was migrated from an existing OS/2 Warp 4, DOS or Windows system, OS/2 Warp 4 will create program objects for your existing applications. To create program objects, use one of the methods described below.

3.4.2.1 Creating a Program Object Using a Template

Find the Program template in the Templates folder (see Figure 67 on page 178), drag it over any folder or the Workplace Shell desktop and drop it. When creating program objects, OS/2 Warp 4 automatically displays the object's Properties notebook, as shown in Figure 78 on page 192. The two most important tabs in this notebook, as shown in Figure 78 on page 192, are the Program tab and the Association tab.

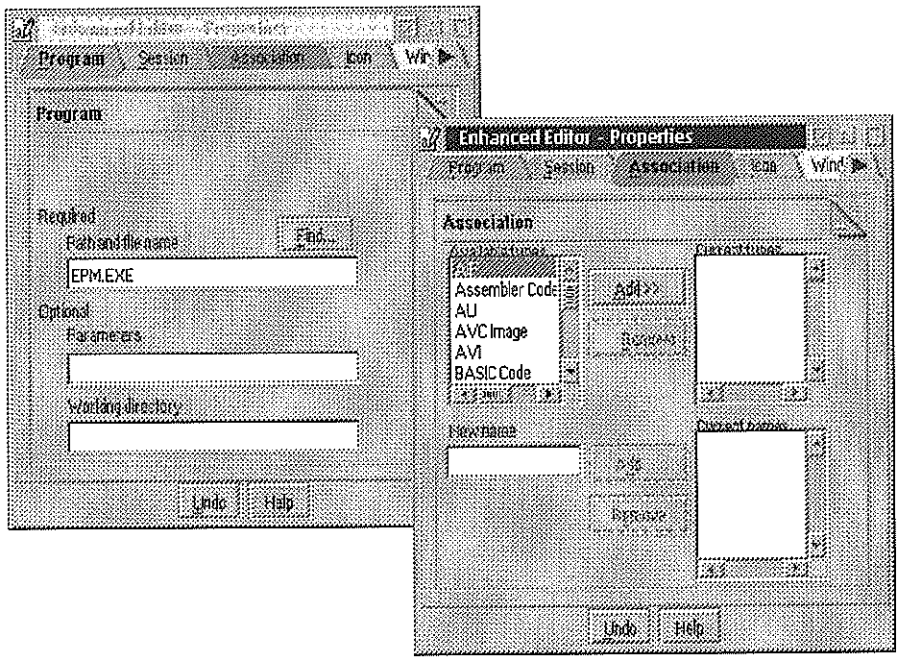


Figure 78. Program Object Properties - Program and Association Tabs

On the Program tab, is the Path and File Name field, which refers to the name of the executable file that runs the program. If required, parameters can be added using the Parameters field, and specifying a working directory for the program (since many applications require their own configuration files, libraries, etc.) using the Working directory field.

Parameters Field Options: As shown in Figure 78, on the Program tab window there is a Parameters field. This can be used to direct input and provide additional settings to program objects as required.

This field can also be used to ask for input in the case of a Batch or CMD file. The Parameters field can be used as follows:

- If you want to type in the parameters each time you start a program, type a left bracket character, a space, and a right bracket character in the Parameters field, as follows:

  [ ]

  When you start the program object, you are then prompted to type the parameters you want to use.

- If you want a special set of characters to be displayed or want to be prompted by a special set of characters each time you start a program, type a left bracket, followed by the characters, followed by a right bracket. For example, if you want to be prompted by the words "This is my text editor," type

  ```
  [This is my text editor]
  ```

- The %* parameter is provided by the operating system. It sends the drive letter and path and file name of a program to the program when it is opened. The %* parameter enables you to open a data file object at the same time you open a program object, in one of two ways. You can drag the data file object to the program object and drop it, or you can open a data file object that you associated to a program.

  When you type parameters in the Parameters field, the operating system sends those parameters to the program object when it is opened and then sends the %* parameter.

  Note: Some programs require that a program-specific parameter be the last parameter sent to the program object when it starts. In that case, you must type %* somewhere before the program-specific parameter.

  For example, assume you have an editor that has a program object named My Favorite Editor. You always want to open the program object with the program parameter NOTABS. The program requires that the NOTABS parameter be the last one sent to the program object. Therefore, you would type the following in the Parameters field:

  ```
  %* /notabs
  ```

  Assume that you have created a data file object named ABC.TXT. If you drag the icon for ABC.TXT and drop it on the icon for My Favorite Editor, the program object for the editor is opened with the NOTABS option and ABC.TXT is displayed.

  If you open My Favorite Editor (the program object) without dropping a data file object over it, the %* is ignored and My Favorite Editor is opened with the NOTABS parameter. No data file object is displayed in My Favorite Editor.

3.4.2.2 Creating a Program Object from a File Object

The Drives object can be used to find the directory that contains the executable program required. Click the right mouse button on this object's icon to display its context menu, as shown in Figure 79 on page 194.

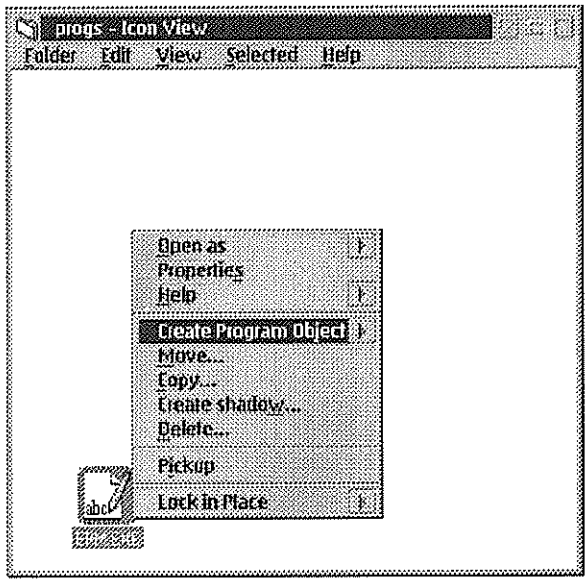


Figure 79. File Object - Context Menu / Create Program Object

Select the **Create Program Object** menu item, select the location for the new program object, for example, Desktop, and select **Create**.

A new Program Object has now been created from the File Object.

3.4.2.3 Associating Programs with Data Files

With the Workplace Shell, links can be set up between file objects and the programs used to work with those files. These links are known as *associations*. These are used to always open certain types of files with specific applications. You can create associations between the program and a certain type of file. For example, files ending in .ico or .ptr could be associated with the Icon Editor.

In the Properties notebook for the program object EPM.EXE (OS/2 Warp 4 Enhanced Editor) shown in Figure 80 on page 195, association settings have been added.

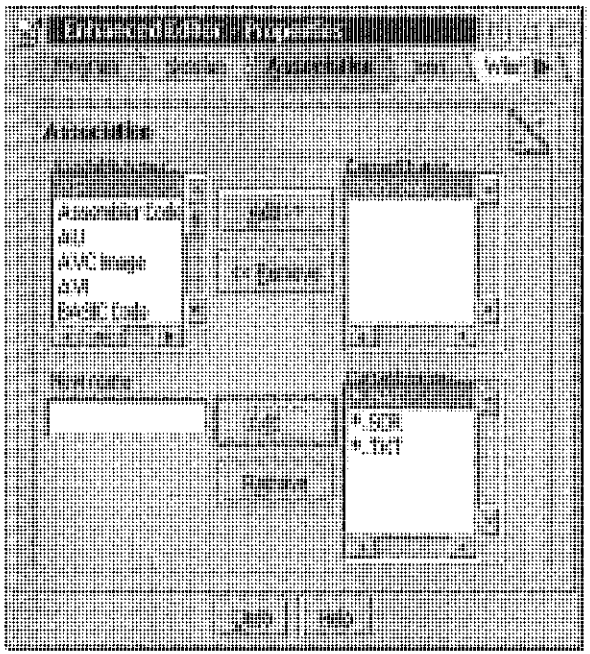


Figure 80. Program Object - Associating Data Types

A file type of Plain Text has been added to the Current types list box, enabling text files to be linked to the Enhanced Editor.

Filename extensions of .BAT, .SCR and .TXT have been added to the Current names list box. This allows a user to double click on any filename with these three extensions, and OS/2 Warp 4 will automatically load the file directly into the Enhanced Editor (EPM.EXE).

This association method can be performed on any Program object stored within the OS/2 Warp 4 system.

3.4.3 Data Files

Data file objects can be plain text files, bitmaps, code, icons, etc. In OS/2 Warp 4, data files are represented by file objects in the Workplace Shell. The Templates folder in Figure 67 on page 178 contains templates for many different types of file objects. While all file objects are similar, they differ in the type (or types) set in the Properties folder.

In OS/2 Warp 4, any file is regarded as a data file unless OS/2 Warp 4 can determine that it is something different, such as a program.

To create a new data file, open the **Templates** folder and locate the template that corresponds to the type of file you want to create. Drag this template to the location where you want to put the new file, and drop it. OS/2 Warp 4 automatically creates the file for you.

When data file objects are created, OS/2 Warp 4 does not automatically open the object's Properties notebook, since it already knows all the information it needs to create the object. If required, the Properties can be opened to change the default information.

The Properties notebook for a .WAV file object is shown in Figure 81.

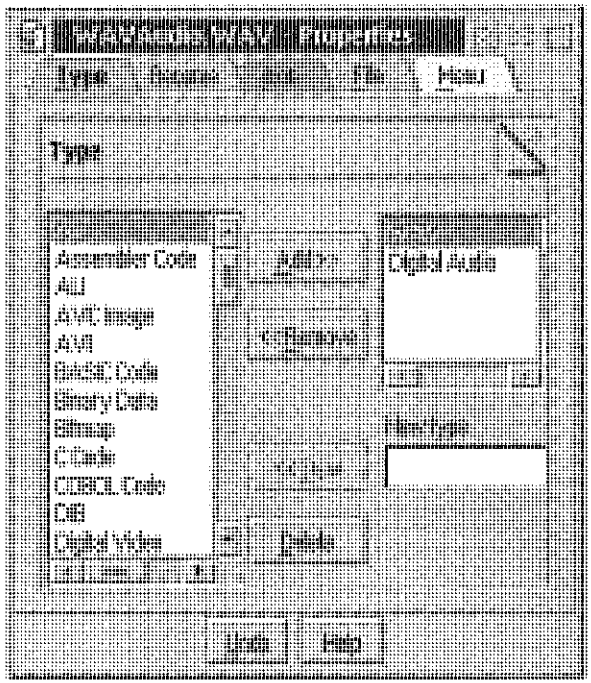


Figure 81. Data File Object - WAVAudio.WAV Properties Notebook

The Type tab is shown in Figure 81. The type of file appears in the Current Types listbox. This type settings can be changed to any type available in the Available Types listbox on the left, by clicking on the **Add>>** or **<<Remove** buttons.

New file types can be added by entering a type in the New Type input area. For example, you might have an application that uses files ending in .SCR. You can create a new type *.SCR for these files. This becomes significant when you want to associate files with programs.

3.4.4 Printers

Any printers attached to a computer are represented in the Workplace Shell by printer objects.

As with all objects in the Workplace Shell, a printer object has a Properties notebook, an example of which is shown in Figure 82.

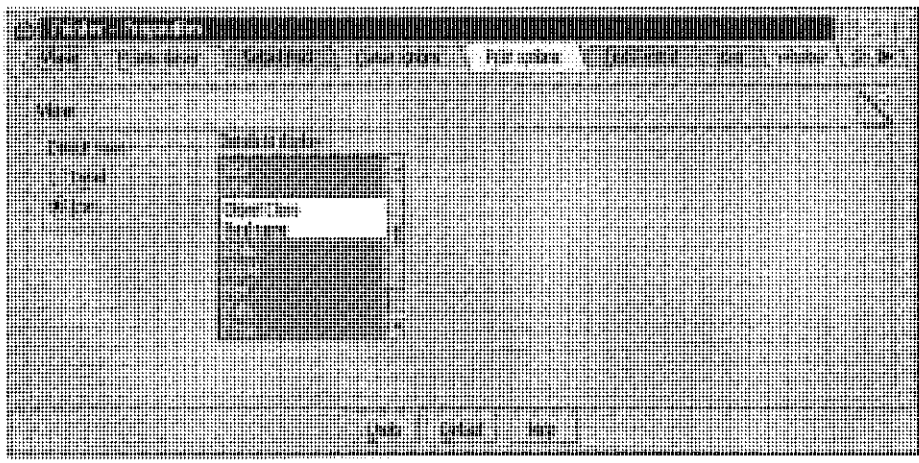


Figure 82. Printer Object - Properties

Almost every aspect of printing is configurable using the Properties notebook for a printer object.

See Chapter 4, "Printing" on page 229 for further information.

3.4.5 Drives

After OS/2 Warp 4 installation, there is a Drives object located in the OS/2 System folder.

The Drives object is a special type of folder object, containing objects that represent all the logical drives attached to your OS/2 Warp 4 system. Figure 83 on page 198 shows a typical Drives folder.

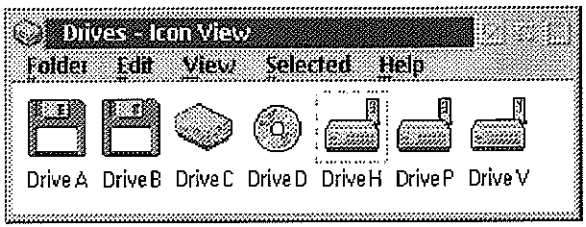


Figure 83. Drives Folder

In Figure 83 the following is represented:

- Drive A = Reserved for floppy drive 1.
- Drive B = Reserved for floppy drive 2.
- Drive C = Local hard drive 1.
- Drive D = Local CD-ROM drive 1.
- Drive H = LAN-attached drive 1.
- Drive P = LAN-attached drive 2.
- Drive V = LAN-attached drive 3.

When opening an individual drive object such as Drive C, one of the views of the drive (Icon, Tree or Details) will be displayed. Each directory on the drive is represented by a folder object, and within each folder there will be objects such as programs, files or other folders.

The Workplace Shell maintains Properties notebooks for the drive objects and the Drives folder itself. The Properties notebooks for the drive objects contain similar items to those for normal folder objects (see 3.4.1, "Folders" on page 190), but the notebook for the Drives folder itself has an additional tab named Reserved. This tab is used to reserve specific drive letters for programs and applications.

OS/2 Warp 4 checks all hard disk partitions and other devices such as CD-ROM drives at startup time, and allocates drive letters to them in sequential order.

In the example in Figure 83 if Drive D: needed to be assigned to a LAN-attached drive, selecting D: on the Reserved tab will cause this drive letter will be omitted when OS/2 Warp 4 allocates drive letters. This then in turn allows Drive D: to be allocated to a LAN-attached drive when you log on to the LAN. The CDROM drive would be allocated to the next available letter, for example E.

When you reserve a drive letter using the Reserved tab, OS/2 Warp 4 automatically updates the system CONFIG.SYS file with the values specified by adding the following statement:

```
RESERVEDRIVELETTER=specified drive
```

Multiple drives can be reserved as required.

3.4.6 Shredder

The Shredder object is used to delete other objects.

To use the shredder, just drag and drop any object onto the shredder object. If the object can be deleted, then the shredder will delete it.

Note that the shredder will not allow you to delete certain types of objects (this is to prevent destroying the Workplace Shell) and will not automatically delete a file that is marked as *read-only*. By default, the shredder asks for confirmation before deleting any object.

3.5 Workplace Shell Custom Settings

OS/2 Warp 4 provide many other user-specified customization functions. These can be accessed from the System Setup icon within the OS/2 System folder. This folder contains the objects which assist in the customization of the Workplace Shell, as shown in Figure 84. The objects shown can also be accessed by one of the default icons on WarpCenter. It is shown by a red open tool box.

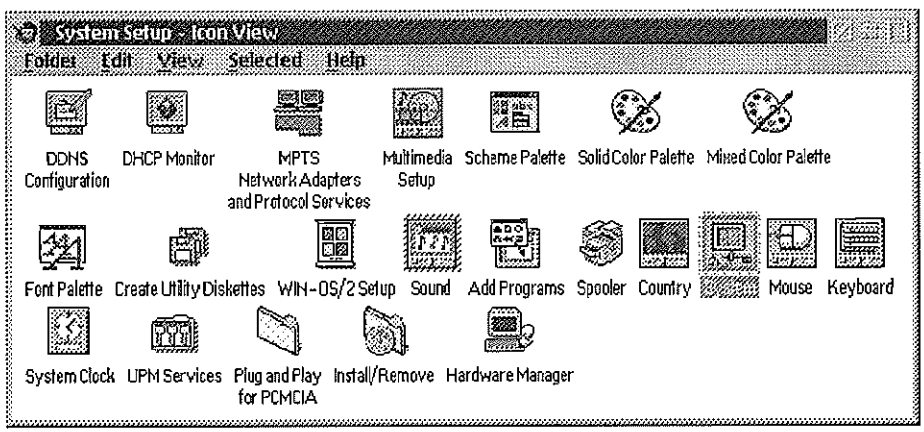


Figure 84. System Setup Folder

The main objects that will affect the appearance and behavior of the Workplace Shell are:

- System Icon
- Sound
- Font Palette

- Solid Color Palette and Mixed Color Palette
- Scheme Palette
- Mouse

3.5.1 Customizing Global System Properties

The System object in the System Setup folder contains a number of global settings that you can change to suit your personal preferences. Figure 85 shows the System object's Properties notebook with the User Interface tab displayed.

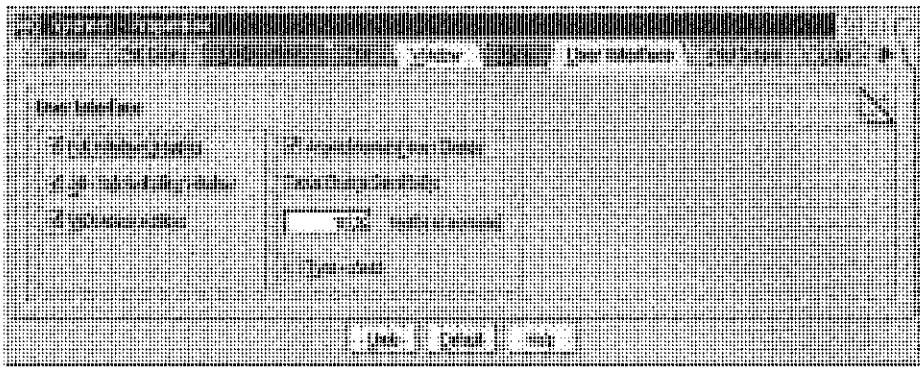


Figure 85. System Properties

Some of the other system settings can be customized on the following tabs:

- **Screen** allows you to change the resolution of your display
- **256 Colors** allows you to select the **Workplace Shell Palette Aware** check box, which in turn can improve the color of bitmaps (some applications may cause you to turn this setting off)
- **Title** allows you to specify the default action that OS/2 Warp 4 should take when you move or copy an object to a folder that already contains an object with the same name
- **User Interface** allows you to toggle several features on or Off. These include:
  - **Full Window Dragging** allows you to view the contents of a window while you are dragging or re-sizing it. By default, this option is *not* set since on slower computers with less-capable video subsystems, it may not behave well.
  - **Alt-Tab** Switching Window
  - **VIO Mouse Actions** allows you to perform actions such as cutting and pasting text with your mouse while in an OS/2 or DOS window. Selecting this option will automatically select the **Mouse Actions** menu item (this can be found on any OS/2 or DOS window by clicking on the title bar icon). For example, to copy text in an OS/2 or DOS window, you would do the following:

1. Select the **VIO Mouse Actions** checkbox.
2. Open an OS/2 or DOS window.
3. Press and hold mouse button 1 and drag your mouse to highlight the desired text.
4. Release mouse button 1.
5. Click mouse button 2 to display the pop-up menu for Mouse Actions.
6. Click on **Copy**. The text is now stored in the clipboard.

You can then paste your text into an editor, another OS/2 or DOS window, or anywhere else that you would normally copy and paste text.

- **Type Ahead**. Select this option to have OS/2 Warp 4 store all of your input (keyboard strokes, commands, mouse actions, etc) for an application you are starting. If **Type ahead** is not selected, your system will not recognize any input for an application until it is fully opened.

3.5.1.1 Asynchronous Focus Change

Asynchronous Focus Change instructs OS/2 Warp 4 to remove focus from any window or application that is monopolizing the message queue. This is specified by the Focus Change Sensitivity setting, in tenths of a second. This setting is shown in Figure 85 on page 200 where it has been set to 10 tenths of a second. In the previous version of OS/2 Warp, this function was known as the Single Input Queue.

Asynchronous Focus Change Operation: When you request a focus change for example, by clicking on another application or pressing Ctl+Esc, the application that has the focus should respond to the message in x milliseconds. If the application does not respond within that time, OS/2 determines that the application is not responding to messages and flags the application queue as bad. It then switches focus to the desired application.

OS/2 will monitor the queue marked as bad to see when it does start responding to messages. It will mark the queue as good when this occurs.

Advantages of the Asynchronous Focus Change feature include:

- Able to be set from within the System icon, located in the System Setup folder on the desktop. No editing of the CONFIG.SYS is required.
- Provides increased security for normal desktop application operation, as no one application can cause the system to crash.
- Increases the ability of the multitasking environment to handle input for different tasks, while others process in the background.

This setting is typically adjusted if problems are experienced with windows not responding to input.

If you think you are having problems with single input queues (SIQ), a way to isolate a problem is to raise the timeout to 5000 milliseconds (5 seconds). If that does not help, turn it off. If there is a SIQ feature problem, this will help IBM to isolate it.

Note!

If Asynchronous Focus Change is not selected, an application may cause your system to wait indefinitely for a response to a focus-change notification.

3.5.2 Changing Icons

Before changing an object's icon, you must have a suitable icon with which to replace it. Icons can be found elsewhere in the OS/2 Warp 4 system, on your network (if present), or even on the Internet. You can also make your own icons, either starting from scratch with a template, or editing existing icons using the Icon Editor utility or the Image Viewer utility.

When you have the icon that you want to use, open the **Properties** notebook for the object for which you want to use the icon, and select the **Icon** tab. Next, simply drag and drop the new icon on the Current Icon box.

Will Any Graphic Make a Good Icon?

The answer is no; since icons are very small, large or detailed graphic images will lose definition. It is best to use simple graphics for icons.

There are a number of other methods by which you can change an object's icon. See the online help text for details.

3.5.3 Changing Desktop/Folder Backgrounds

The procedure for changing the background color or graphic image of the Workplace Shell desktop or of an individual folder object is very similar to that for changing an icon. If you would like to use an image for your background, you must first find the image that you want to use. If you have installed the Multimedia OpenDoc Support option on your OS/2 Warp 4 system, you can use any of the graphics formats supported by this option, including the popular GIF and JPEG formats common on the Internet. If you have not installed this option, you *must* use a bitmap (*.BMP) file.

Where Can You Find Images?

The best place to look for images is the Internet! Most of the image files that you can view with WebExplorer are in an acceptable format (provided you have installed OS/2 Warp 4's Multimedia OpenDoc Support option) and you can find many fantastic backgrounds.

When you have found the image you want to use, open the Properties notebook for the folder or the Workplace Shell desktop and select the **Background** tab. Make sure that the Color Only check box is *not* selected, then drag and drop the object representing the image file on to the Preview box. Close the notebook and the operation is complete.

Will Any Graphic Make a Good Background?

As with icons, the answer is no. As you experiment, you find that some graphics will not make good backgrounds because their proportions may not fit the area of your desktop or folder, or they may lose definition when displayed.

If you have an image that does not look as good as you want, you can work with the Normal, Tiled and Scaled radio buttons in the Image box on the Background tab, to try to improve the appearance of the image file.

If you do not want to use an image for your background, you can still change the color of the background from within the Properties notebook by making sure that the Color Only check box on the Background tab is selected, and clicking on the **Change Color** button.

Note that we do not recommend using this method to change the background color of your desktop or a folder. There is an easier method using the Mixed Color Palette or Solid Color Palette. This method is described in 3.5.6, "Changing Individual Colors" on page 206.

3.5.4 Changing the Mouse Pointer

OS/2 Warp 4 does not restrict the user to a single style of mouse pointer. The Mouse object in the System Setup folder allows the configuration of a number of options for the mouse pointer. Figure 86 on page 204 shows the Properties notebook for the Mouse object, with the Pointers tab displayed.

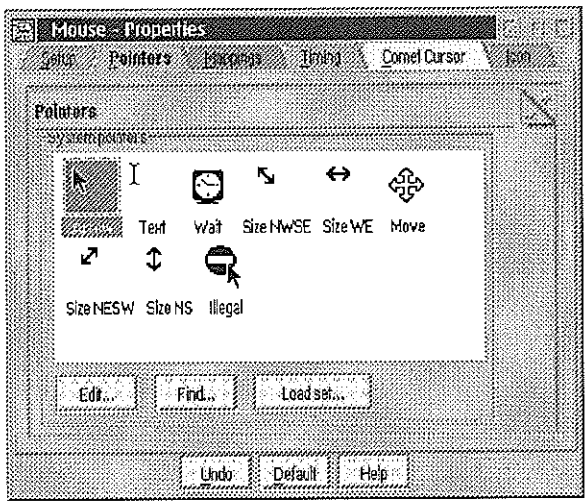


Figure 86. Mouse Properties

There are many options available, including the ability to swap mouse buttons using the Setup tab, thereby allowing for both left- and right-handed people.

The two tabs that allow the customization of the mouse pointer are:

- The Pointer tab allows you to load any of several predefined sets of mouse pointers, by selecting the **Load** set button and selecting a set of pointers from the resulting list.
- The Comet Cursor tab allows you to create a trail that follows your mouse pointer on the screen.

3.5.4.1 Pointers

If you feel particularly artistic, you can even develop your own mouse pointers using the Icon Editor utility, and install them on your OS/2 Warp 4 system. To do this, create a subdirectory within the D:\OS2\POINTERS directory (where D: is the drive on which you have installed OS/2 Warp 4) and copy your pointers into that directory. Your pointers *must* be called:

- ARROW.PTR
- ILLEGAL.PTR
- MOVE.PTR
- SIZENESW.PTR
- SIZENS.PTR
- SIZENWSE.PTR
- SIZEWE.PTR
- TEXT.PTR

- WAIT.PTR

These names correspond to the names of the pointers shown in Figure 86 on page 204. Each mouse pointer's *hotspot* must be set, which is the area on the mouse pointer that determines where the pointer is pointing (for example, the point on an arrow pointer). You can set the hotspot in the Options pull-down menu in the Icon Editor utility.

When the icons are in the appropriate subdirectory, click on the **Load Set** button in the Pointers tab to load them into the OS/2 Warp 4 system.

If you prefer to modify an existing set of pointers rather than develop your own pointers from scratch, you can click on the **Edit** button on the Pointers tab.

3.5.4.2 Comet Cursor

The Comet Cursor trail is displayed as you move your mouse pointer, and can help you see your pointer more easily, particularly on some portable computer screens. The Comet Cursor tab allows you to turn the comet cursor on or off, change the color and size of the trail, as well as setting the minimum pointer speed at which the comet cursor feature takes effect.

3.5.5 Changing Fonts

The default Font Palette in the System Setup folder provides a palette of eight fonts from which you can select a font to use for any object. Note that while this font palette holds only eight fonts, OS/2 Warp 4 actually provides many additional fonts. You can change the fonts that appear in the default font palette, and even create your own font palettes for additional fonts by clicking on the **Font Palette** template in the Templates folder. OS/2 Warp 4 supports both Adobe Type Manager and TrueType fonts.

Changing a font in any object is now a drag-and-drop operation. Select the font in the Font Palette window, then drag it to the object for which you want to change the font. When you release the right mouse button, the font will change. This technique also works with many word processing packages.

To change a font within the Font Palette window, double-click your left mouse button on the font, then select the **Edit Font** button. This will display the Edit Font window as seen in Figure 87 on page 206.

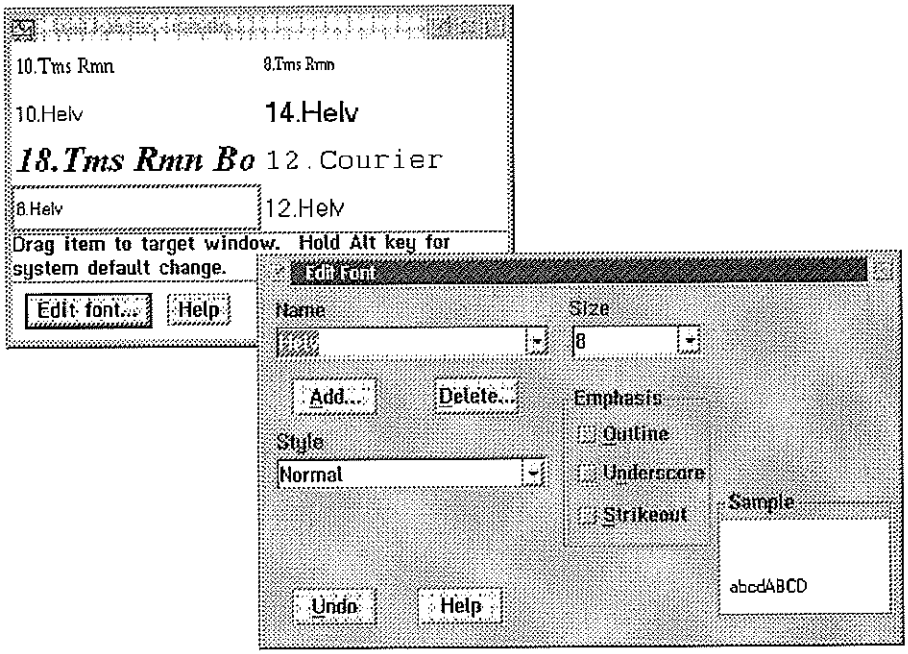


Figure 87. Font Palette and Edit Font Windows

You can replace an existing font in the Font Palette window by using the **Add** button in the Edit Font window. OS/2 Warp 4 will present a list of available fonts from which you can choose.

3.5.6 Changing Individual Colors

The Mixed Color Palette and Solid Color Palette objects work in a similar manner to the Font Palette object. When either of theses objects are opened OS/2 Warp 4 displays a window containing a set of colors. After selecting a color, you can drag and drop it on the object for which you want to change the color.

If the object on which you drop the color is a folder object or the Workplace Shell desktop, there are some additional considerations:

- You must have selected the **Color only** check box in the object's Background tab, or the new color will have no effect.
- The color you select *may* cause the text displayed beneath a folder's icons to be illegible. If this happens, go to the View tab of the object's Properties notebook, where you have the following options in the Title Text Display box:

- Select the **Visible** check box to display text below or beside the icons. When this check box is not selected, icons are displayed without any title text.
- Select the **Font** button to display the Edit Font window, allowing you to change the font for the icon's title text.
- Select the **Bkgnd color** button to display the Color Wheel that enables you to specify the color of the background for the icon text. This will highlight the text and may make it easier to read
- Select the **Text color** push button to display the Color Wheel that enables you to specify the color of the icon text.
- Select the **Shadow color** push button to display the Color Wheel that enables you to specify the color of the icon text for your *shadowed* objects.
- Select **Transparent background** to specify that the background color for the icon text is to be transparent; that is, the text will appear directly on the folder's background, with no visible background of its own.

3.5.7 Changing System Sounds

OS/2 Warp 4 allows the association of sounds with a number of system events such as starting the Workplace Shell, opening and closing windows etc.

The Sound object allows you to change the sound attached to any individual system event. Figure 88 shows the Sound object's Properties notebook with the Sound tab displayed. From this tab, you can associate a system event with a sound file.

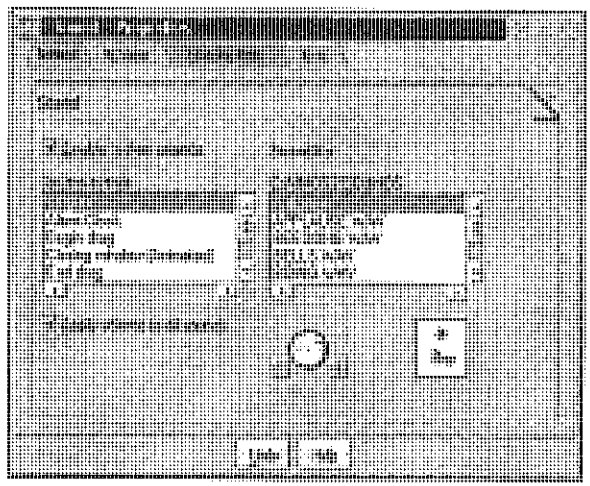


Figure 88. Sound Properties

First select an event from the System events list on the left, then choose a sound file from the Sound file list on the right. The <Try it> item in the System events list allows you to listen to a sound before completing the selection.

The Scheme tab contains sets of sounds, known as schemes, which are already allocated to the various system events. This makes it easy to change from one set of sounds to another, without the need to change each sound individually.

3.5.8 Schemes

All the elements described in the previous sections (fonts, colors and sounds) can be combined into schemes.

Schemes can be selected from the default Scheme Palette which can hold up to twelve schemes.

To apply a scheme to your OS/2 Warp 4 system, simply drag and drop the scheme to your Workplace Shell desktop. OS/2 Warp 4 will automatically make all the required changes.

If required, you can modify the schemes contained in the default scheme palette. Figure 89 on page 209 shows the default Scheme Palette, along with the Edit Scheme window. This window is displayed when you double-click the left mouse button on a scheme. It allows the editing of the scheme selected to suit your own requirements.

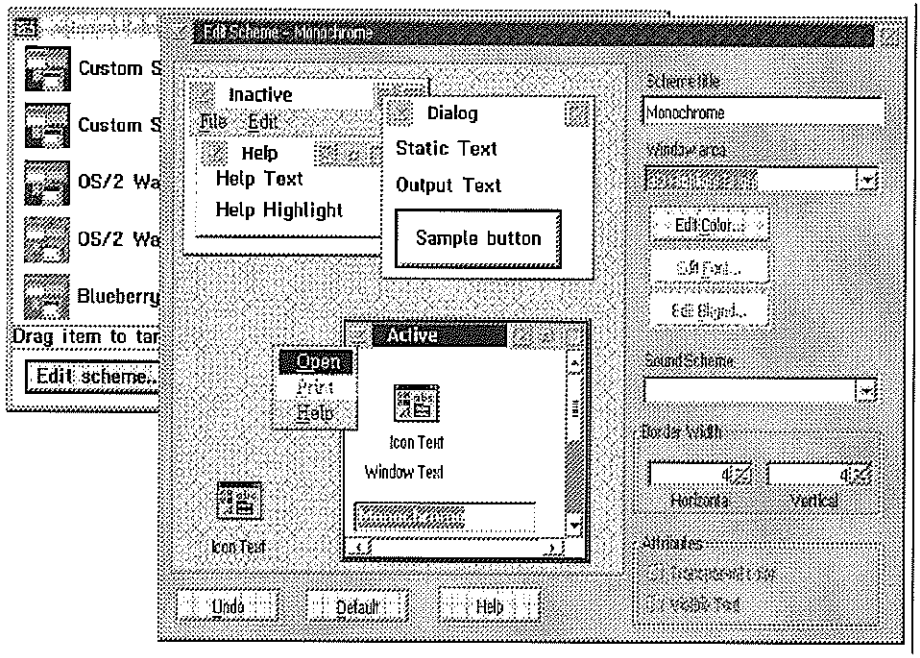


Figure 89. Scheme Palette and Edit Scheme Windows

While developing a scheme it is previewed in the box on the left of the Edit Scheme window.

You can create your own schemes and scheme palettes using the Scheme Palette template in the Templates folder. Using this template is exactly the same as using any other template; just drag the template to the location where you want to store your new scheme palette, and drop it. The new palette will initially contain the same schemes as the default palette. You can then modify these schemes to suit your own requirements.

3.6 Desktop Properties Folder

The Desktop Properties folder is displayed by clicking with the right mouse button on the desktop, then selecting **Properties.** The Desktop Properties folder is then displayed as shown in Figure 90.

The three buttons at the bottom of the Properties folder have the following functions:

- **Undo** - Returns the settings to their previous values.
- **Default** - Sets the default values as they were at installation.
- **Help** - Provides context-sensitive help about each field listed.

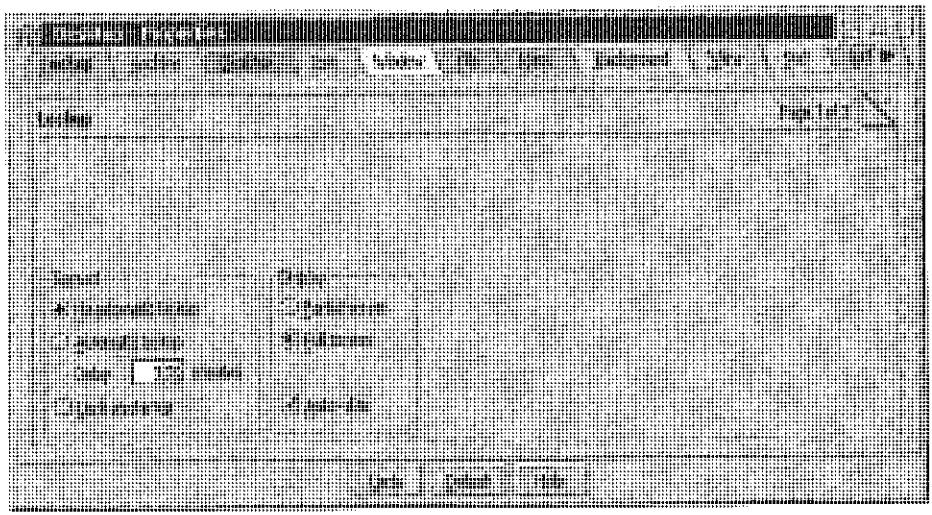


Figure 90. Desktop Properties Folder Settings

3.6.1 Lockup

The Lockup tag provides security for your system. A bitmap or logo can be displayed over the top of the desktop, and a password must be entered to clear the screen and thus allow use of the desktop.

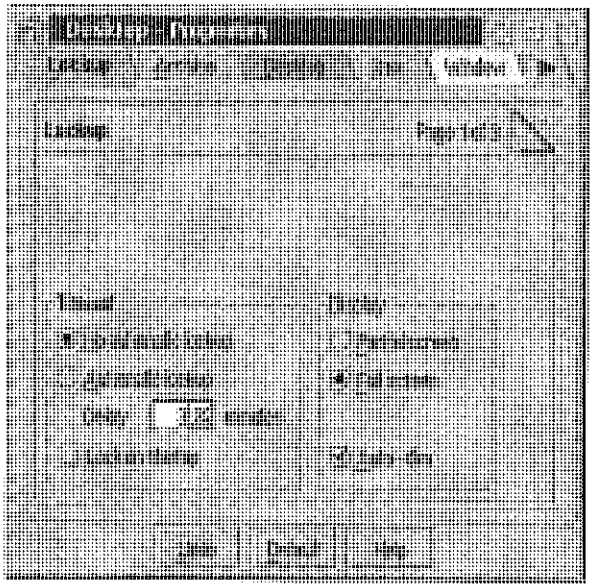


Figure 91. Desktop Lockup Window Page 1 of 3

3.6.1.1 Lockup Options

The Lockup Timeout and Display options are displayed on page 1 of the Lockup settings, shown in Figure 91.

Automatic Lockup: Enables the system to lockup after a designated interval. This delay is controlled by the delay setting, measured in minutes. The delay counter is reset to zero every time there is a key press or mouse action.

Lock on Startup: Sets the system to lock when it is booted. If the password is lost, the system will not be accessible unless system recovery procedures are used. See Chapter 10, "Recovery" on page 773 for more information.

Display: Options allow for all or only part of the screen to be covered when lockup happens. The Auto-dim functions enables a moving lock to appear and also causes the screen colors to dim providing protection from screen burn-in.

Lockup Image: Is set on page 2 of the Lockup settings. To access this, click once on the + symbol located in the top right hand corner of the folder.

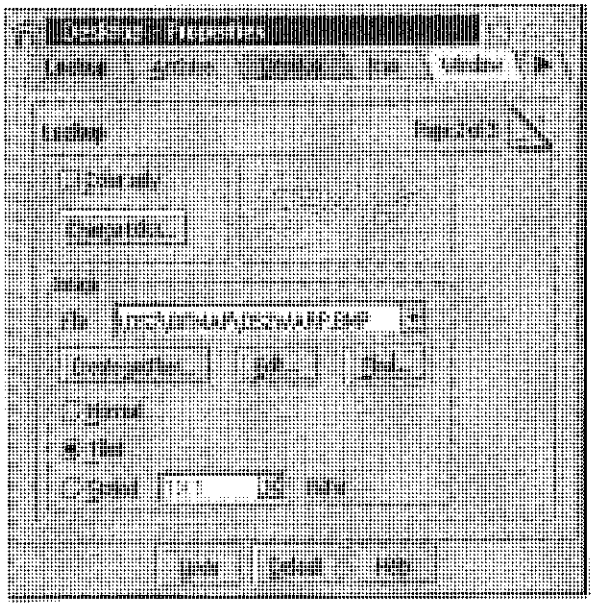


Figure 92. Desktop Lockup Window Page 2 of 3

The displayed image can be either a simple color or a detailed bitmap selected by the user. The image can be displayed as normally viewed, tiled around the screen, or scaled if required.

Lockup Password is set on page 3 of the settings. It has a maximum length of 15 characters and must be entered twice for verification. Figure 93 on page 213 displays the password settings.

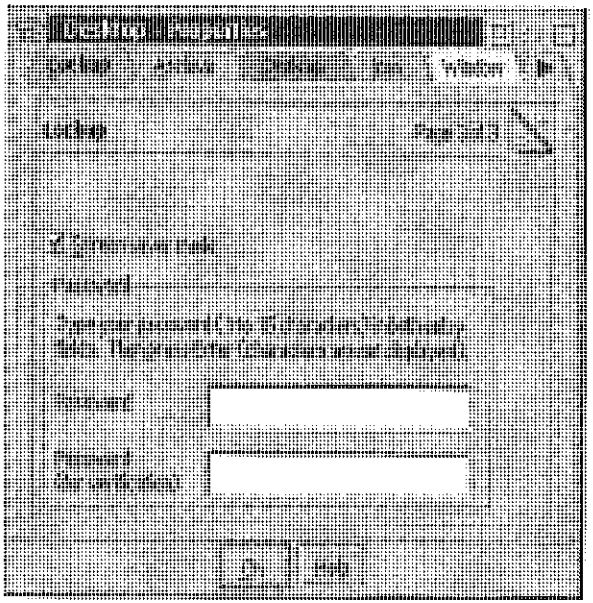


Figure 93. Desktop Lockup Window Page 3 of 3

3.6.2 Archive

OS/2 Warp 4 includes a feature that allows for the creation of an automatic backup of system configuration files, including the Workplace Shell desktop, every time you boot or reboot your system. This is known as the desktop archive feature, and the backup copies it creates are known as archives. If a system crash occurs, the backup copies can be restored by a simple key stroke. See Chapter 10, "Recovery" on page 773 for more details.

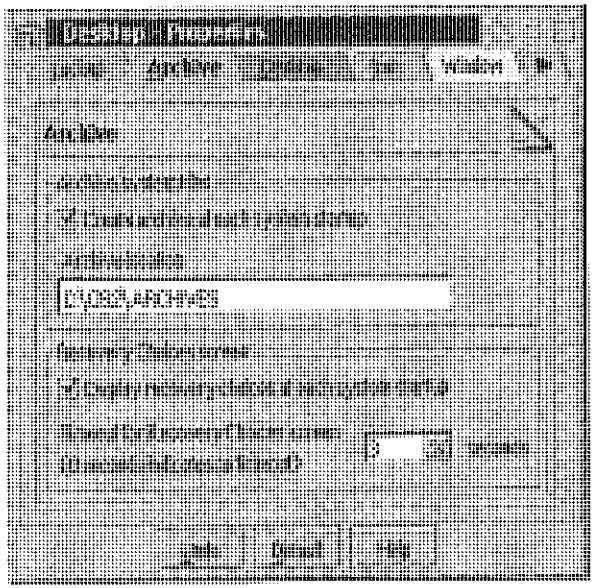


Figure 94. Desktop Archive Settings

Figure 94 has the Create archive at each system Startup option selected, and the archive files stored in the default location C:\OS2\archives (where C: is the bootdrive). This option will cause OS/2 to create a new set of archive files each time the system is rebooted.

Archive files and recovery choices are explained is detail in Chapter 10, "Recovery" on page 773.

3.6.3 Desktop

The Desktop Properties tag has three settings as shown in Figure 95 on page 215.

The Save Desktop Properties option allows the operator to keep the desktop objects, open programs and folders in the same location at each boot.

> **Note**
>
> After the desktop is set, it is best to disable this option so unwanted changes are not saved.

Default Drop operation occurs when an object is moved by clicking and holding down the right mouse button on an object and dragging it to a new location.

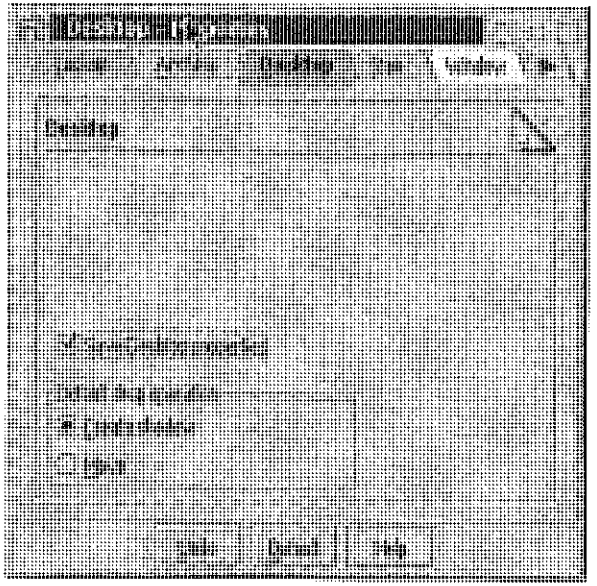


Figure 95. Desktop Archive Settings

3.6.4 Icon

The Icon settings allows a user to change the default installation name of the Workplace Shell - Desktop. This can be a name, a business title, etc., as shown in Figure 96 on page 216.

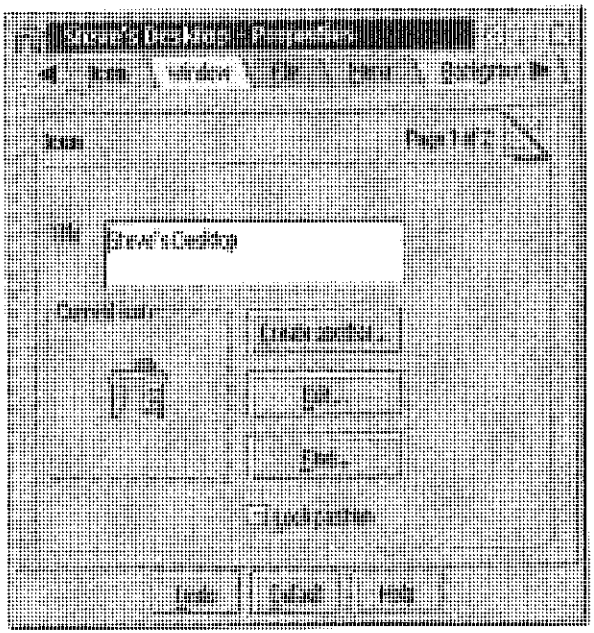


Figure 96. Desktop Icon Settings

The Lock in Position setting does not affect the desktop, as its main function is served on objects located on the desktop itself.

3.6.5 Window

The Window settings controls the behavior of the Workplace Shell as a window. These settings relate to the control buttons as shown in Figure 61 on page 171.

3.6.6 File

The File settings tag enables a greater degree of flexibility and control when naming objects.

A 40-character description can be entered into the subject field. The Objects actual details are stored in the Physical name fields, best seen on a data or program object.

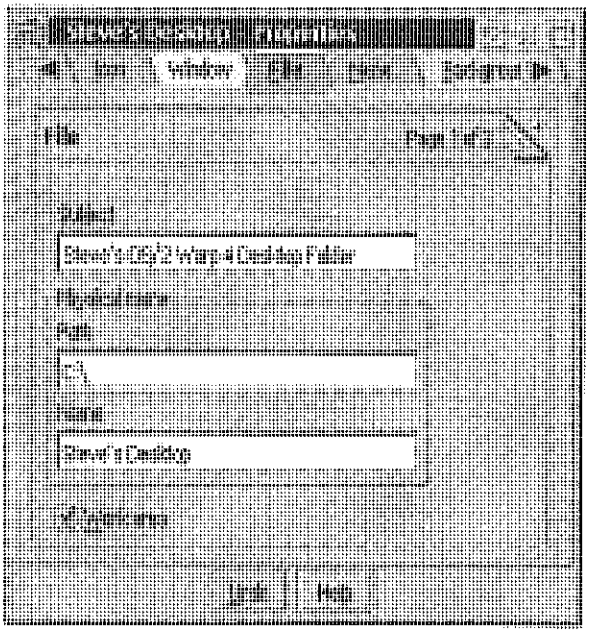


Figure 97. Desktop File Settings (Page 1)

The Work Area check box is used to designate a special setting for the selected folder. The folder then becomes a work area folder in which you can place objects that are related to a specific task. For example, you might create a work area folder to include a current report, previous reports, and a printer with customized settings; or, you might create a work area folder to include charts, documents, and a plotter.

Work area folders have two special features. When you close the folder, all windows belonging to the objects within the folder are closed automatically and the view of each object is saved. When the folder is opened the next time, the windows for the objects in the folder are displayed with their previous view. The other feature is when the window is hidden, all other windows belonging to the objects in the folder are hidden automatically. When selecting the work area folder (from the Window List), the windows for the objects in the folder are displayed with their previous view.

Note

Work area folders function with the Icon or Details View, but not with the Tree View.

Page 2 of the File Settings contains specific file creation, modification and last accessed details, and also the attributes of the file.

Page 3 is used to enter any comments or key phrases about the file. Any information on Page 3 is part of the extended attributes for the object.

3.6.7 Menu

The Menu settings further enable the customization of the desktop. These settings enable the adding of frequently used programs to the desktop's context menu.

The example given below describes how to add a cascade menu for command prompts, and then place each of the command prompt objects from the system folder underneath this menu option.

1. First select **Properties**, then the **Menu** tag from the desktop Context menu.
2. Click on the **Create Another** button next to the available menus box, and enter a Menu name, for example Command Prompts.
3. Select the default Menu type, **Cascade Menu.**
4. Click on the new Menu item - **Command Prompts**. The screen should be the same as Figure 98.

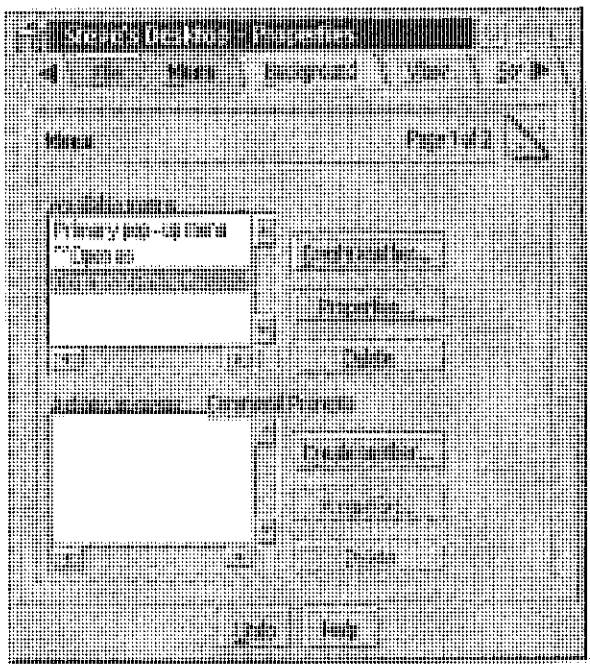


Figure 98. Adding a Custom Menu for the Desktop

5. Open the Command Prompt folder object from with the system folder, and select and drag all of the prompts to the Actions on menu: Command Prompt window and release, as shown in Figure 99 on page 219.

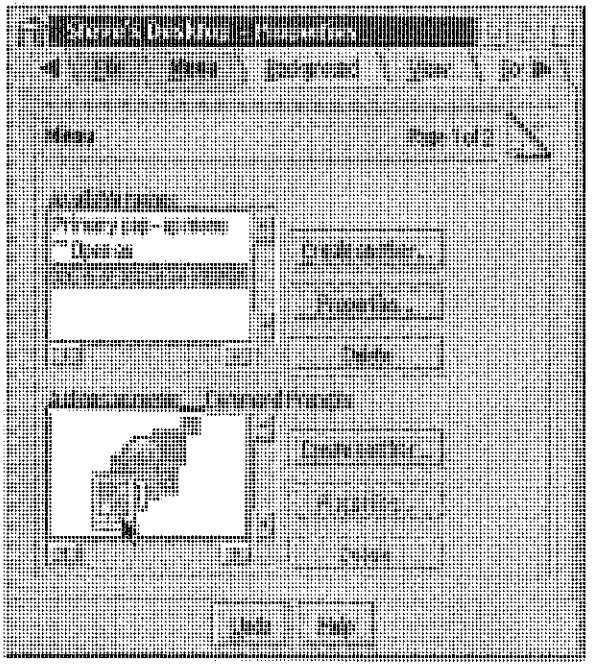


Figure 99. Dragging the Command Prompt Icons

6. All of the prompts should now be displayed in this window.
7. Close the Desktop Properties folder and right click on the desktop. The menu should now have a Command Prompt option, and all the prompts listed under the cascaded menu.

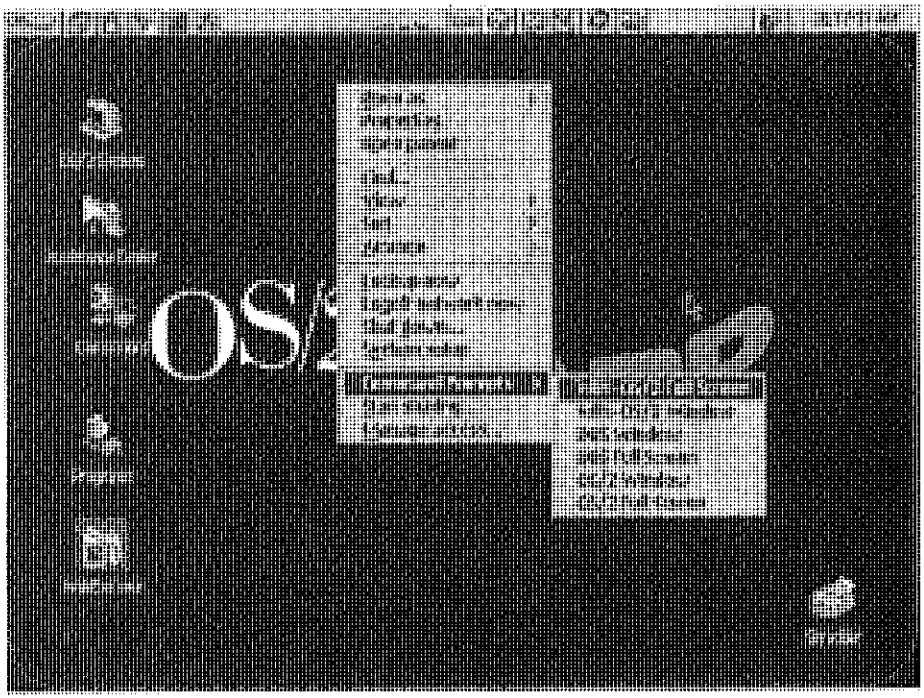


Figure 100. Desktop Context Menu with Command Prompts

3.6.8 Background

The Background settings allow for a bitmap display. All these settings are identical to those described in 3.6.1, "Lockup" on page 210. Figure 101 on page 221 displays the optional settings.

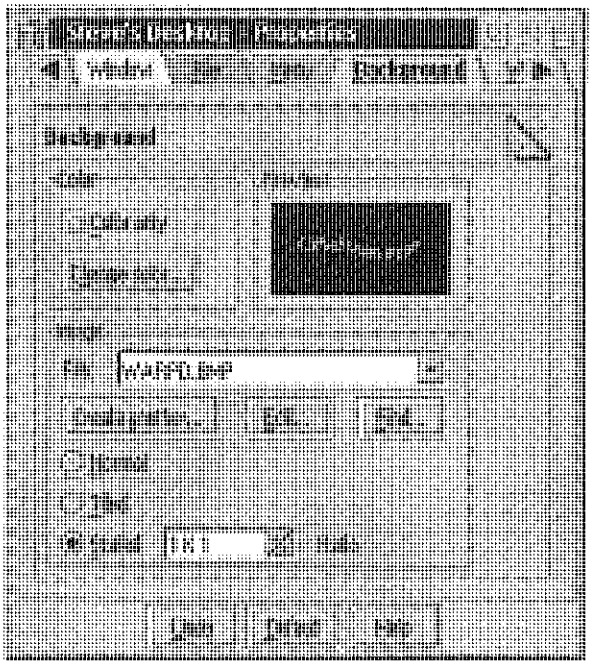


Figure 101. Desktop Background Settings

3.6.9 View

The View settings window are used to select how icons and their related text are displayed.

The Layout View fields are used to select the positioning of icons on the desktop. The Icon Spacing button increases or decreases the amount of space between each listed icon.

The Icon display field is used to select the size of the icons, or to make them invisible.

The Icon text field is used to select the font, color, and background for the text that appears below or beside an icon. The text for the icon can also be turned off.

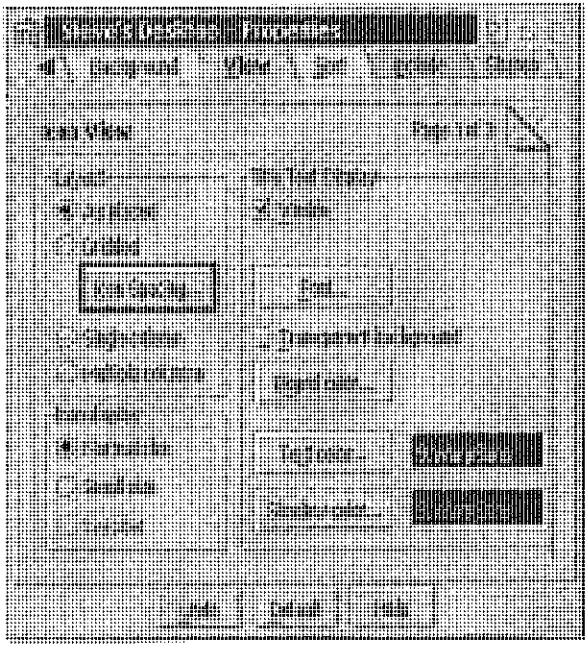


Figure 102. Desktop Icon View Settings

Pages 2 and 3 contains further settings specific to each view, the Tree and Detail view.

3.6.10 Sort

This Sort settings window determines the contents of the Sort pop-up menu located on the Desktop Context menu.

This enables the selection of the default sort attributes and other options.

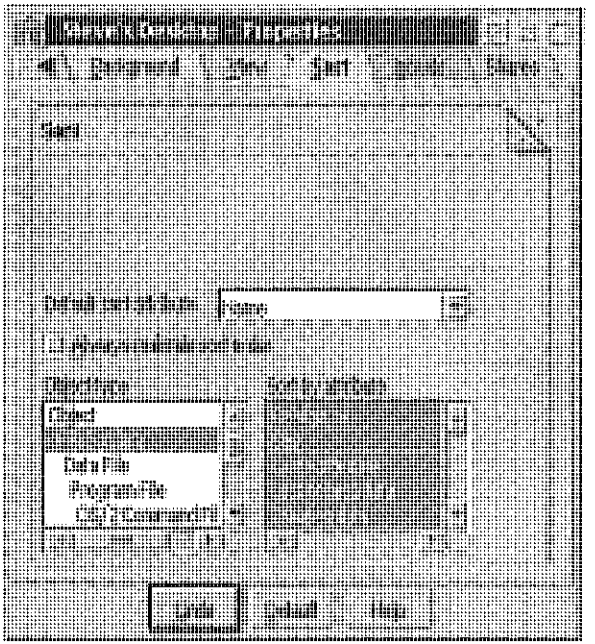


Figure 103. Desktop Icon View Settings

3.6.11 Include

The Include settings windows is used to include objects that you want on the desktop and exclude objects that you don't want in your folder.

> **Note**
>
> The objects that you choose to exclude are still in existence. They are simply not visible. To make the objects visible again, select the **Default** push button on the Include page.

3.6.12 Other Tags

Other tags may appear under the Desktop Properties folder specific to hardware and program settings installed on the system. These may include Speech, Shares, etc.

3.7 Controlling Windows

An OS/2 window has a number of elements. Figure 104 on page 224 shows these major elements. The elements can be used to customize the window's appearance and

behavior. These include changing the size of the window, changing the font, deciding on full screen or windows, and also whether mouse actions are permitted.

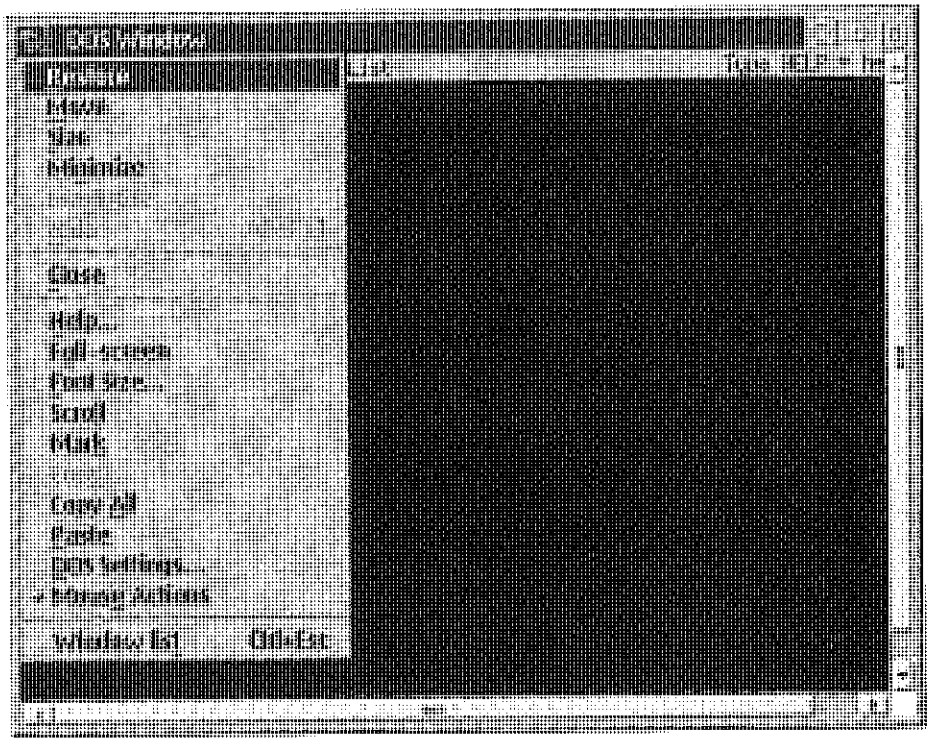


Figure 104. Workplace Shell Open Window (DOS)

3.7.1 Window Control Icon

The Control icon lists all the functions available to control the appearance, location, size, and settings of the window. The items listed on this Control icon have the following functions.

3.7.1.1 Restore

The Restore function returns the window to its original location on the desktop when first opened on the desktop. This can be used after the Maximize function has been issued.

3.7.1.2 Move

The Move function allows for the repositioning of a window without using a mouse. When this is selected a four-way arrow appears, indicating the window can be moved in any direction.

3.7.1.3 Size

Like the Move function, the Size function allows a window to be increased or decreased in size without using a mouse. When this is selected, with the keyboard control arrows, the window can be changed as desired.

3.7.1.4 Minimize

When the **Minimize** function is selected, the current window will either:

- Become an icon at the bottom of your screen
- Be listed inside the minimized window viewer

These settings are controlled in the Properties folder, under the Window tab, for the object.

To restore a minimized window, double-click on the icon. Alternatively, you can bring up the Window List, click the right mouse button on the window's title to display the pop-up menu, and choose **Show**.

3.7.1.5 Maximize

Maximizing a window means making it as big as possible. Usually this results in a full-screen window, occupying the entire space of your monitor. Sometimes, however, programmers build in a definition that is less than full-screen.

To maximize a window, click on the **Maximize** button, or with a keyboard, select the **Maximize** function, or you can double-click in the title bar. Double-clicking again in the title bar returns the window to its previous size and position.

3.7.1.6 Hide

When the Hide function is used, no minimized icon appears at the bottom of the screen. To restore a hidden window, you must use the Window list, by double-clicking on the windows title.

3.7.1.7 Help

The Help function will launch the context-sensitive online help for the current window, for example a DOS or OS/2 window.

3.7.1.8 Full Screen

The Full-screen function only applies to DOS windows. This function simply causes the window to cover the complete screen. This can also be performed by a keyboard stroke Alt+Home.

3.7.1.9 Scroll

Scroll allows the complete windows contents to be viewed, by moving the internal contents up and down using the keyboard control arrows.

3.7.1.10 Mark
The Mark function enables the copying of data from a window to a new location within OS/2 Warp 4. This is enabled automatically when clicking and dragging a mouse in a window, provided the **Mouse Action** function is selected.

3.7.1.11 Copy
Copy will then copy the marked text that has been selected, described in the sentence above

3.7.1.12 Copy All
The function will copy the complete contents of a window without using the Mark function.

3.7.1.13 Paste
Allows the contents of the Clipboard to be placed into the window. This contents can then be treaded as a command or part of a command.

3.7.1.14 DOS Settings
DOS Settings only apply to a DOS window. These settings control the DOS environment parameters that are normally set in the AUTOEXEC.BAT and CONFIG.SYS on a DOS machine.

3.7.1.15 Mouse Actions
Mouse Actions enables the mouse to be used within the window.

3.7.1.16 Shutting Down Your System
When you have finished using your OS/2 Warp 4 system, you should always shut down.

OS/2 Warp 4 holds disk cache buffers and certain Workplace Shell information in memory, and this information can be lost if OS/2 Warp 4 is simply switched off. For this reason, the Shutdown command should always be issued before you reboot your system or switch off your computer.

If the Shutdown command is not issued, as in the case of a power failure, OS/2 Warp 4 includes a mechanism to overcome such situations. Whenever you boot OS/2 Warp 4, the operating system checks to see whether it has been shut down correctly. If not, OS/2 Warp 4 will issue a `CHKDSK` command during boot-up, to check the hard disk for errors and rectify any errors that it finds. In most cases, this error-checking overcomes any problems that might have occurred. The drawback, however, is that a `CHKDSK` command can take a long time to execute, particularly if you have a large hard disk. This means that your OS/2 Warp 4 system will take a long time to boot. For this reason, you *do not* want to perform a `CHKDSK` every time you boot your system, so you should issue a Shutdown command whenever possible.

A Shutdown command can be issued in one of several ways:

- Click your right mouse button on a vacant area of the Workplace Shell desktop to display its context menu, then select the **Shut down** item.
- Select the **Initiate OS/2 Shutdown** icon in the WarpCenter window.
- Select the **Shutdown** button on the launchpad.

OS/2 Warp 4 will ask for confirmation to end all the open applications and shut down your OS/2 Warp 4 system. If you select **OK**, OS/2 Warp 4 will go ahead and shut itself down. You will see a message on your screen telling you when it is safe to reboot your system or switch off your computer.

Chapter 4. Printing

OS/2 Warp 4 has powerful printing capabilities that enable you to create printed output from your system. OS/2 Warp 4 allows you to print files and documents from within applications, from command prompts and from the Workplace Shell. OS/2 Warp 4 boasts some impressive printing features that allow you to:

- Use drag and drop to move and copy jobs between printer objects
- Use drag and drop to reprioritize jobs in a printer object
- Define a default print priority for each printer object
- Automatically download printer drivers
- Automatically maintain printer drivers and printer properties
- Fully exploit intelligent printers

4.1 Printing from the Workplace Shell

You can print a file from the Workplace Shell in two ways:

- Find the file's icon on your desktop or in a folder. Click and hold your right mouse button over the icon, drag it over a printer icon, then release your right mouse button to drop the file on the printer.
- Find the file's icon on your OS/2 Warp 4 desktop or in a folder. Click your right mouse button on the icon, then select **Print** from the resulting context menu.

These two methods produce identical results, so it does not matter which method you choose. The latter method is useful when you have many windows open on your desktop, and your printer icons are not visible.

> **Note:**
>
> You can only use the Workplace Shell to print text files, or to print files that contain data in a language that can be interpreted directly by a printer. Files that are formatted using an application such as Lotus WordPro must be printed from within that application.

OS/2 Warp 4 allows you to print data files and documents from within your applications, just as you would under DOS or Windows. Your printers appear under OS/2 Warp 4 as LPT1, LPT2 and so on, exactly as they appear under DOS or Windows, so you can use your application to select the printer that you wish to use, then issue the print command within the application.

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4.2 Printer Drivers

Each printer and plotter connected to your system requires at least one printer driver. A printer driver can support several printer models. If the local printer for which you are creating the printer object is a Plug and Play printer, OS/2 automatically selects the correct OS/2 and WIN-OS/2 printer drivers for the LPT port.

Before you can print anything from OS/2 Warp 4 you must install a printer driver. There are several ways of installing printer drivers in OS/2 Warp 4, each leading to the same result.

4.2.1 Installing Printer Drivers during Installation

You can install printer drivers and create printer objects during OS/2 Warp 4 installation, or using the Selective Install utility. See 2.6, "Selective Install" on page 55 for details. During installation, OS/2 Warp 4 will display the System Configuration window, as shown in Figure 105.

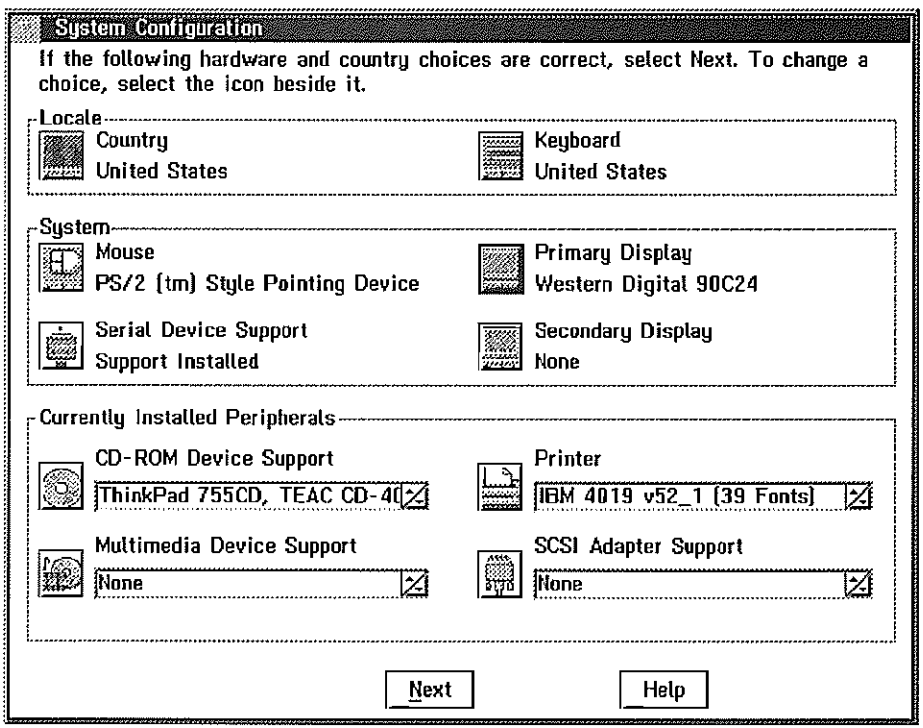

Figure 105. System Configuration Window

Near the bottom right of this window, you will see a Printer icon. If you select this icon with a single click of your left mouse button, you will see the Select System Default Printer window, as shown in Figure 106 on page 231.

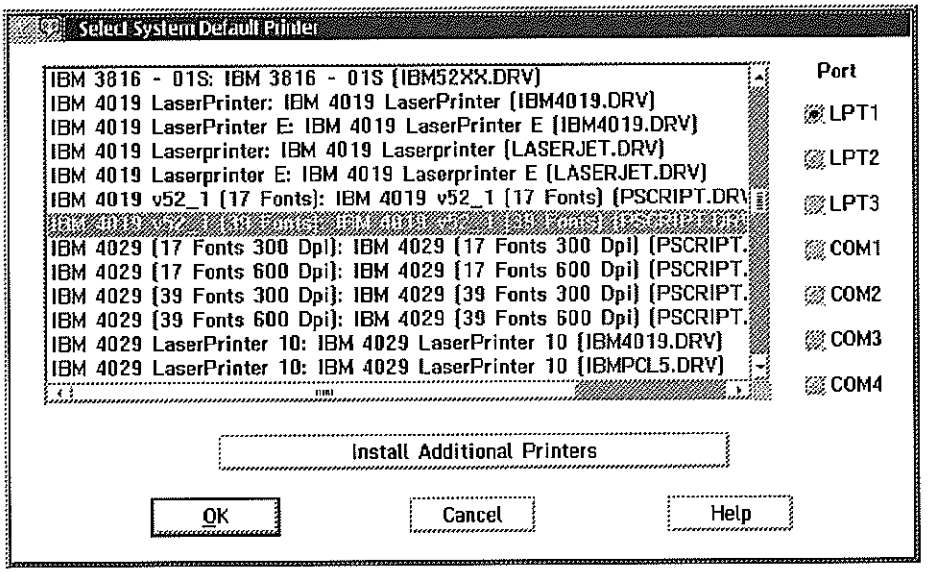

Figure 106. Select System Default Printer Window

Select the printer you require from the extensive list of printers available. If your printer is not listed, but you have a device driver diskette for the printer, select **Do not install default printer** from the list, and follow the instructions for installing additional printer device drivers as described in 4.2.2, "Installing Printer Drivers Using Templates."

After you complete the installation process or exit the Selective Install utility, you will be asked to shut down and reboot your OS/2 Warp 4 system. When you reboot, you will find a printer object in the Printers folder, which resides in the Connections folder on your desktop.

The advantage of this printer driver installation method is that the WIN-OS/2 printer driver is automatically installed at the same time as the OS/2 Warp 4 printer driver.

4.2.2 Installing Printer Drivers Using Templates

In your Templates folder or the Printers folder within your Connections folder, you will find a Printer template. You can create a new printer object by dragging and dropping this template to your desktop or a folder where you want the new printer object to reside. OS/2 Warp 4 will display the Printer - Create a Printer window as shown in Figure 107 on page 232.

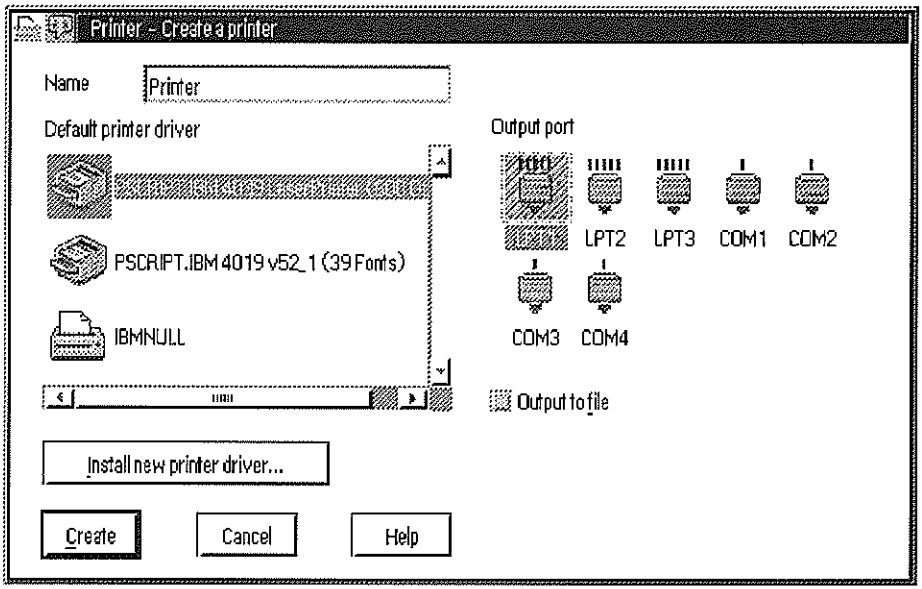

Figure 107. Printer - Create a Printer Window

The Default printer driver list box shows the printer drivers that are currently installed on your system. If the new printer is shown in this list, select it. Note however, that this list does not show all the printer drivers that are available for OS/2 Warp 4. Other printer drivers reside on your OS/2 Warp 4 CD-ROM and are not installed on your hard disk.

If your printer is not listed among the printer drivers already on your hard disk, select the **Install new printer driver** button. OS/2 Warp 4 will then display the Install New Printer Driver window as shown in Figure 108 on page 233.

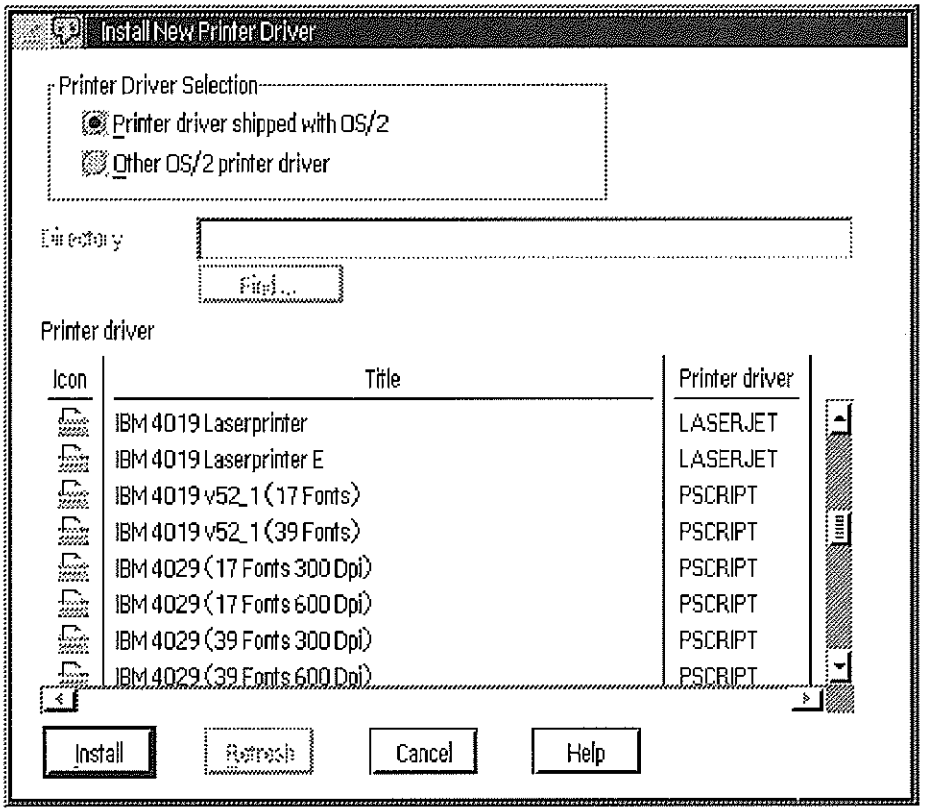

Figure 108. Install New Printer Driver Window

The list of drivers in this window shows all the printer drivers available on your OS/2 Warp 4 CD-ROM. Select the printer you require from the list of drivers available.

If your printer is still not shown, you need to obtain a printer driver from the printer manufacturer, and then select the **Other OS/2 printer driver** radio button in the Printer Driver Selection box at the top of the window. Enter the location of the printer driver files (for example, A:) in the Directory field, click on **Refresh** and select the appropriate driver. Click the **Install** button to install the printer driver.

Finally, make sure that the Name field shown in the Printer - Create a Printer window as shown Figure 107 on page 232 shows the name you have selected for this printer object and that you have selected the appropriate **Output port**. Then select the **Create** button to create a printer object. If the WIN-OS/2 printer driver is *not* automatically installed, OS/2 Warp 4 will ask you whether you want to install this driver. We recommend installing the WIN-OS/2 driver whenever you intend to run Windows applications on your system. You might not want to print files from Windows applications right now, but you may want to do so in the future.

At this point, your printer driver is installed, your printer object is created, and you are ready to print.

4.2.3 Installing Printer Drivers Using WarpGuide

You can create printer objects and install printer device drivers using WarpGuide.

To find the *Guidance on Adding a Printer* guide:

- Double-click on **Assistance Center**
- Double-click on **WarpGuide**
- Double-click on **Guidance on Adding a Printer**

You will see the Create a Printer window, as shown in Figure 109.

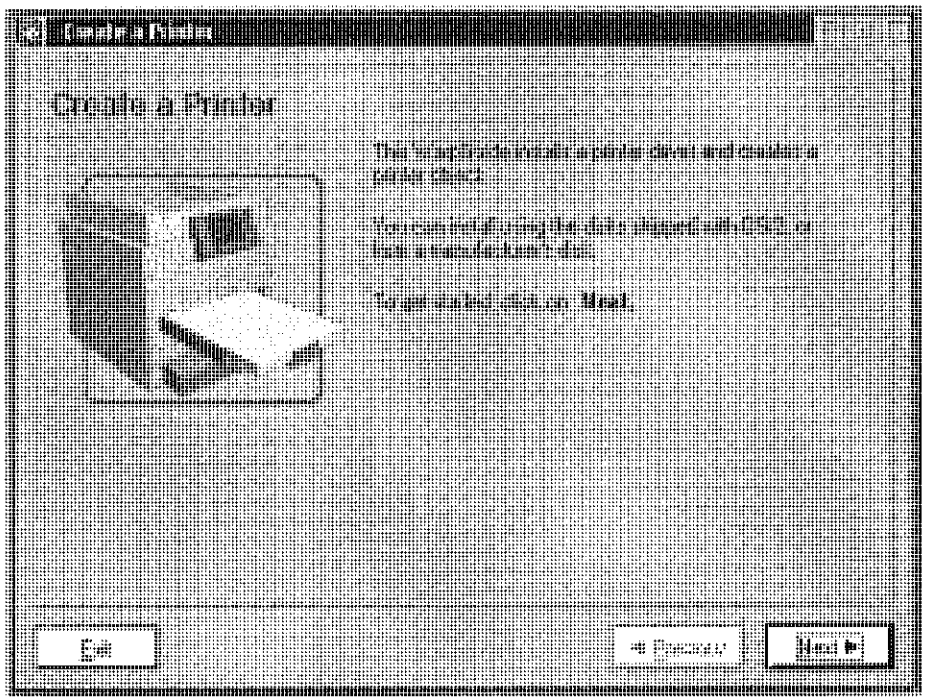

Figure 109. Create a Printer Window

This WarpGuide gives you step-by-step instructions for installing a printer with its associated device driver. It will also create a printer object in the Printers folder, which resides within the Connections folder on your desktop.

OS/2 Warp 4 will ask you if you want to install the WIN-OS/2 printer driver for this printer. This will allow you to use the printer from Windows applications running under

OS/2 Warp 4. We suggest that you install the WIN-OS/2 printer driver. Your printer is now installed and ready to use.

4.2.4 Obtaining New and Updated Printer Drivers

As discussed above, OS/2 Warp 4 provides an extensive list of printer drivers for you to install and use. However, there may be times when you want to install a printer that is not on the list or there may be an update available for a printer driver that you are currently using. In either case, you will need to obtain and install the new or updated printer driver. The best place to start is on the OS/2 Device Driver Pak CD that comes with OS/2 Warp 4. For information on how to use the OS/2 Device Driver Pak CD, see Appendix C, "OS/2 Device Driver Pak CD" on page 987.

4.2.5 Update Printer Drivers Automatically

When you log on to a LAN server or peer domain, OS/2 automatically maintains your local and network printer objects with the most current printer drivers and printer properties. You can select when the update is to occur:

- Double-click on **OS/2 System**
- Double-click on **System Setup**
- Display the pop-up menu for the Spooler object
- Click on **Properties**
- Click on **Advanced options** tab

In the Printer driver synchronization field, choose one of the following:

- **Update printer drivers after login**

  Click on this check box to update printer drivers and printer properties each time you log on to the LAN server. This is the default setting.

- **Automatic daily updates**

  Choose the time of day when you want your printer drivers and printer properties updated, by using the scroll buttons to specify the hour and minute. Then click on the **AM** or **PM** radio button.

- **Update printer drivers now**

  Click on this button to update your printer drivers and printer properties immediately.

4.3 Printer Drivers and Objects

You may occasionally want to change the printer driver for an existing printer object or change the object for an existing driver on your OS/2 Warp 4 system. For instance, you may buy a new printer to replace your old one, and the new printer may be a different model or brand. To set up the new printer on your OS/2 Warp 4 system, you can delete the old printer object and create a new one, or you can simply change the printer driver associated with your current printer object.

4.3.1 Create a Print Object with an Existing Driver

To create a new printer object for existing printer driver:

- Double-click on **OS/2 System**
- Double-click on **Templates**

Drag the Printer template to a folder or the desktop. The Printer - Create a Printer window is displayed as illustrated in Figure 107 on page 232. Accept the default name or type a new name for the printer in the Name field.

- Click on the port to which the printer is connected
- Click on the printer driver that corresponds to your printer model
- Click on **Create**

Respond to "Do you want to install an equivalent WIN-OS/2 printer configuration." Select **Yes** if you want to print from a WIN-OS/2 session. Otherwise, select **No.**

A new printer object will be created.

4.3.2 Create a Printer Object and Install a Driver

To create a new printer object and install a driver:

- Double-click on **OS/2 System**
- Double-click on **Templates**

Drag the Printer template to a folder or the desktop. The Printer - Create a Printer window is displayed. Type a name for the printer in the Name field. This window is illustrated in Figure 107 on page 232.

- Click on the port to which the printer is connected
- Click on **Install new printer driver**
- For a printer driver that ships with OS/2 Warp 4
  - Select your printer driver
  - Click on **Install**
- To install a printer driver that did not come with OS/2:
  - Click on **Other OS/2 printer driver**
  - Insert the diskette containing the printer drivers in drive A
  - Click on **Refresh**
  - Click on one or more drivers
  - Click on **Install**

Respond to "Do you want to install an equivalent WIN-OS/2 printer configuration." Select **Yes** if you want to print from a WIN-OS/2 session. Otherwise, select **No.**

A new printer object will be created.

4.3.3 Install a Printer Driver for an Existing Printer Object

Many printers can have multiple printer drivers. If you have a printer object but do not have the correct printer driver, you can install additional printer drivers, or re-install a printer driver that has been damaged. To install a new printer driver:

- Display the pop-up menu for the printer object
- Click on **Properties**
- Click on the **Printer driver** tab
- Display the pop-up menu for the printer-driver object
- Click on **Install**
- Click on **New driver** to install a new driver
- Click on **New device** to install a new device

The Printer Object Properties window is shown in Figure 110 on page 238.

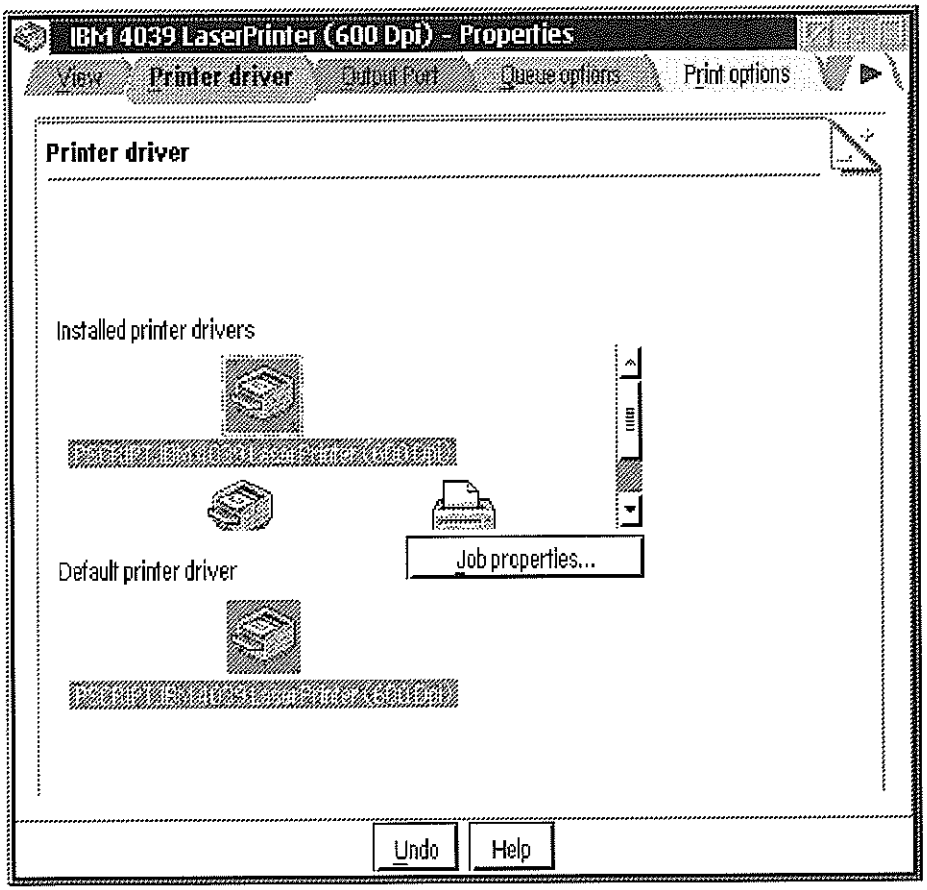

Figure 110. Printer Object - Properties Window

4.3.4 Install a Windows Printer Driver

WIN-OS/2 programs print directly to the OS/2 spooler. Therefore, multiple print jobs can be spooled from one WIN-OS/2 session or multiple WIN-OS/2 sessions. To install a printer driver in WIN-OS/2:

- Double-click on **OS/2 System**
- Double-click on **Command Prompts**
- Double-click on **WIN-OS/2 Full Screen**
- Double-click on **WIN-OS/2 Main**
- Double-click on **Control Panel**

- Double-click on **Printers**
- Click on **Add**
- Click on a printer driver in the list
- Click on **Install**

Insert the diskette containing the printer drivers in drive A, or type the appropriate drive and path in the Install Driver window.

- Click on **OK**
- Click on **Connect**
- Click on **LPT1.OS2**, **LPT2.OS2**, or **LPT3.OS2**
- Click on **OK**
- Click on the printer that you want to assign as the default
- Click on the **Set As Default Printer** push button
- Click on **Close**

The WIN-OS/2 Printer Driver Installation windows are shown in Figure 111 on page 240.

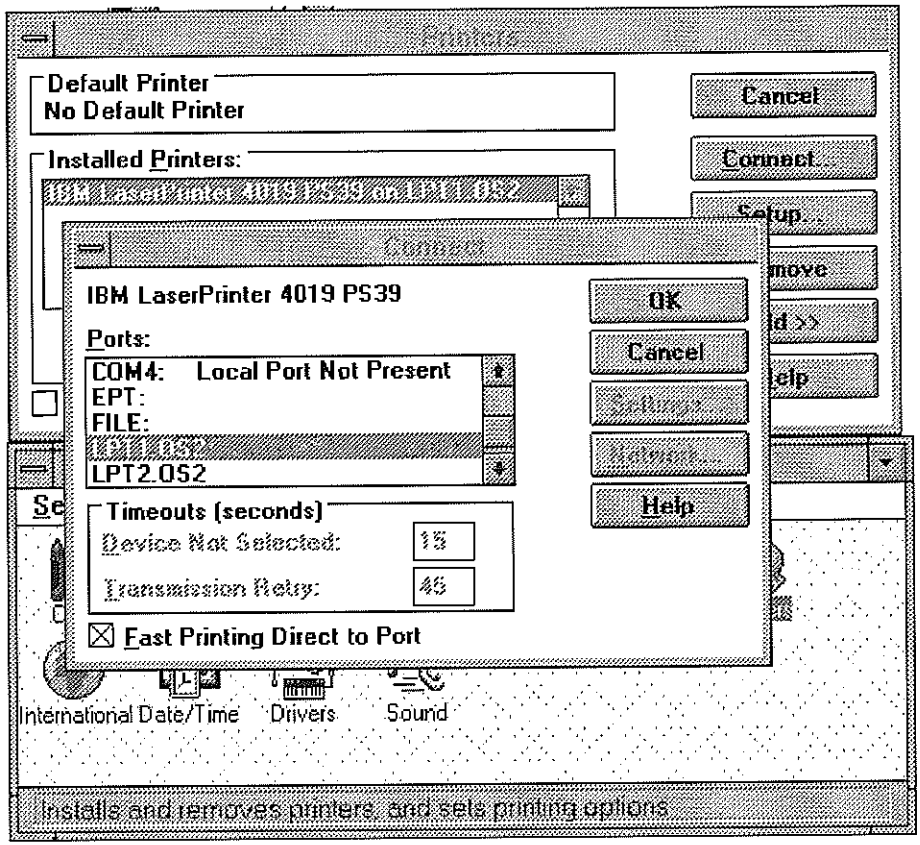

Figure 111. WIN-OS/2 Printer Driver Installation Windows

OS/2 has a wide variety of printer drivers available for use with WIN-OS/2. However, there might be times when you want to use a driver supplied by another printer manufacturer. To add a WIN-OS/2 printer driver supplied by another printer manufacturer:

- Double-click on **OS/2 System**
- Double-click on **Command Prompts**
- Double-click on **WIN-OS/2 Full Screen**
- Double-click on **WIN-OS/2 Main**
- Double-click on **Control Panel**
- Double-click on **Printers**
- Click on **Add**

- Click on **Unlisted Printer**
- Click on **Install**

Insert the diskette containing the printer drivers in drive A, or type the appropriate drive designation and path in the Install Driver window.

- Click on **OK**
- Click on **Connect**
- Click on **LPT1.OS2**, **LPT2.OS2**, or **LPT3.OS2**
- Click on **OK**
- Click on the printer that you want to assign as the default
- Click on the **Set As Default Printer** push button
- Click on **Close**

You now should be able to print from a WIN-OS/2 session.

4.3.5 Change the Default Printer Driver

To change the default printer driver for a printer object:

- Display the pop-up menu for the printer object
- Click on **Properties**
- Click on the **Printer driver** tab
- Click on the new default driver
- Close Properties

Check the printer properties of the default driver and make any changes necessary to correspond the properties with the physical setup of your printer. If the printer object represents an intelligent printer, you can set the printer properties to the actual configuration of the intelligent printer.

4.3.6 Change the Current Printer Driver

If you want to use a different printer driver with a printer object, you will have to change the current printer driver associated with that object. To change to a different printer driver:

- Display the pop-up menu for the printer object
- Click on **Properties**
- Click on the **Printer driver** tab
- Click on the printer driver
- Close Properties

The printer object is now set up to use a different printer driver. Ensure that the printer properties match the capabilities of the physical printer. If the printer object represents an intelligent printer, you can set the printer properties to the actual configuration of the intelligent printer.

4.3.7 Delete a Printer Driver

To delete the printer driver object:

- Display the pop-up menu for the printer object
- Click on **Properties**
- Click on the **Printer driver** tab

If the driver you want to delete is selected in one or both fields of the Printer Driver page, deselect the driver in the Printer driver field and select a different driver as the default.

- Display the pop-up menu for the printer driver
- Click on **Delete**
- Double-click on the **title bar** icon

If this driver is used in any other printer objects, a window appears showing those printer objects. For each printer object identified, display the Printer Driver page in its Properties notebook and deselect this printer driver in the Printer driver field.

4.4 Printer Ports

A port represents the connection between your printer or plotter and your computer. OS/2 Warp 4 supports the following types of printer ports:

- Parallel

  A parallel port name begins with the letters LPT. It is the most commonly used port type. LPT1 is the preselected choice for the first printer you install.

- Serial

  A serial port name begins with the letters COM. This port also is known as a communications port.

- Infrared

  An infrared port enables you to print on a printer with an infrared port adapter.

- Network

  A network port enables you to print on a printer with an internal network adapter or a printer connected to a "black box" with an internal network adapter.

Check your printer or plotter documentation to determine the type of port that your device uses. OS/2 Warp 4 automatically installs the ports LPT1-LPT3 and COM1-COM4

during installation. You can make the following alterations to the ports on your system later.

4.4.1 Add or Reinstall a Printer Port

To add a different port to your system or to reinstall a port you deleted:

- Display the pop-up menu for the local printer object
- Click on **Properties**
- Click on the **Output Port** tab
- Click on **Install new port**
- Click on **New port driver**

Insert the diskette containing the new ports in drive A, or change the path in the Directory field.

- Click on **Refresh**
- Click on a port from the Output port field
- Click on **Install**

Your new port will now be installed.

4.4.2 Printer-Port Properties

You can change the properties of a parallel port, network port, or serial communications setup. For example, to change the timeout period for a parallel port or the configuration for a serial port:

- Display the pop-up menu for the port object
- Click on **Properties**

Depending upon the type of port, a Parallel Port Properties window, Serial Port Properties window, or Network Port Properties window displays in which you can make your changes. The two most popular ports used by printers today are parallel and serial. In the following section we will have a look at the settings for these ports. The Printer Properties - Output Port window is shown in Figure 112 on page 244.

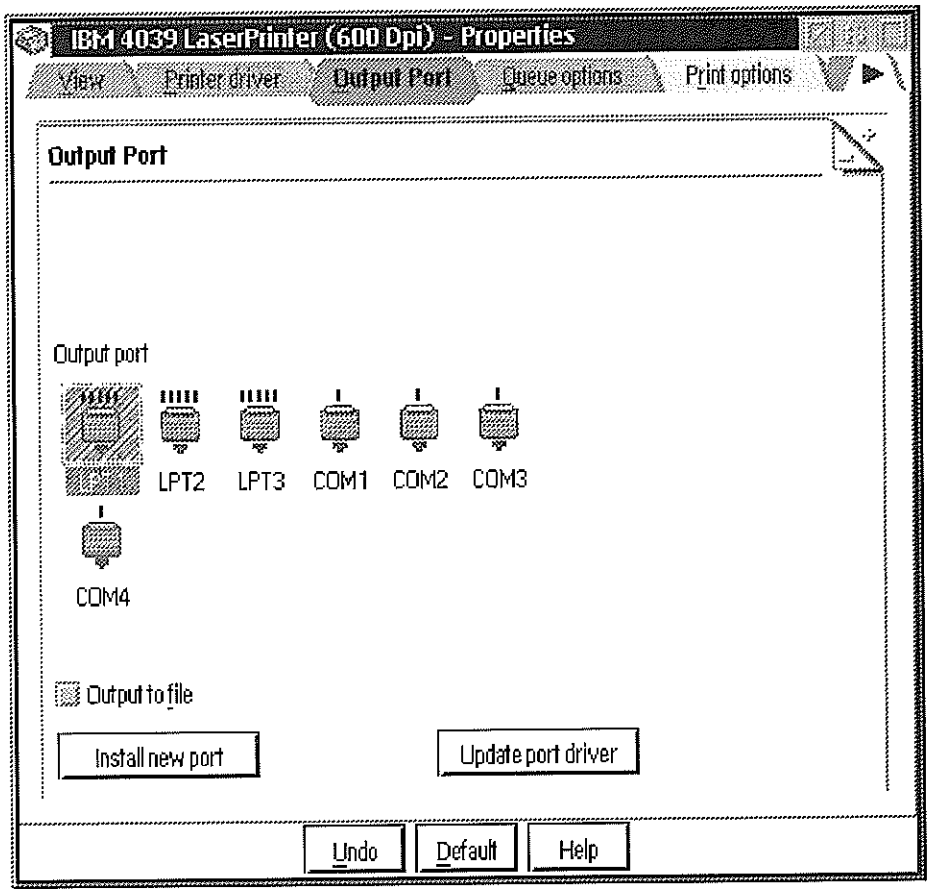

Figure 112. Printer Properties - Output Port Window

4.4.2.1 Parallel-port Properties

Parallel-port properties adjust the period of time the printer or plotter needs to assemble print-job information. You can also allow DOS programs to share the access of the parallel port.

The Timeout field sets the number of seconds the computer retries to print before changing the printer-object status to Error, indicating a print-error condition. The default value for this field is 45. Suggested timeout periods are shown for the following printer models:

- Matrix printers such as Epson and Proprinter

10 seconds or less. A short timeout allows rapid reporting of conditions such as printer offline.

- Laser printers such as 4019 or HP LaserJet

  45 seconds. These printers might need time to process your print information before printing.

- PostScript printers

  120 seconds or more. These printers often need time to process information before printing a page and signaling readiness to receive more information.

The Share access check box allows multiple DOS programs to share a parallel port. Sharing access might be required for DOS programs that access a security device (dongle) connected to the parallel port.

Share access is disabled (unchecked) as the default. If this choice is checked and you get intermixed output from DOS programs, return it to the unchecked state.

4.4.2.2 Serial-port Properties

The serial-port default properties that follow work with most printers or plotters. However, you can change these properties to match the properties recommended in the manufacturer's documentation.

- The baud rate is the speed at which information moves across a communication line. The default baud rate for printer and plotter communications is 9600. The baud rate you select must match the baud rate of your printer.
- The word length is the number of bits that represent a character. The preselected choice is 8 bits.
- The preselected type of parity checking is None. (If the manufacturer's documentation specifies that the printer ignores parity but still expects it, select a parity other than None.)
- The preselected number that corresponds to the signal length that your printer or plotter manufacturer specifies for stop bits is 1.
- Handshake describes the communication between the devices (the communications protocol between the OS/2 operating system and your printer or plotter). Use the preselected choice, Hardware, if the exchange of information is controlled by electronic signaling (DTR Pacing). Cabling must conform to the precise specifications of the printer manufacturer to work properly using the hardware serial-port handshake. Click on **None** if the exchange of information is between programs and is controlled by XON/XOFF.
- The Timeout field sets the number of seconds the computer retries to print before changing the printer-object status to Error, indicating a print-error condition. The default value for this field is 45.

4.4.3 Pooling Printers

When you assign more than one port to a single printer object, you are pooling printers. In this way, jobs waiting to print or plot can be processed through any free port, increasing the number of jobs that can print at the same time. When you pool printers, all the printers or plotters connected to these ports must use the same printer driver. To pool printers (print jobs through more than one port for faster processing):

- Display the pop-up menu for the printer object
- Click on **Properties**
- Click on the **Output Port** tab
- Click on two or more ports
- Close Properties

4.4.4 Display All Local Printer Ports

You can display all local printer ports installed on your computer. To display the ports:

- Display the pop-up menu for any local printer object
- Click on **Open as**
- Click on **Port view**

The Spooler - Port View window displays the details view of the ports. You can change the port Properties by clicking on the port objects in the Spooler - Port View window.

4.4.5 Change the Printer Port

If you move your printer or plotter to a different port, you need to change the port selected for any printer object associated with the printer. To change the port:

- Display the pop-up menu for the printer object
- Click on **Properties**
- Click on the **Output Port** tab
- Deselect any port that does not connect to the printer or plotter
- Click on the correct port in the Output port field
- Close Properties

4.4.6 Redirect a Printer Port

You can redirect a printer port so that output spooled to that port is redirected to the printer object you select. Redirecting a printer port is useful if a printer must be taken offline for servicing. To redirect a printer port to another printer:

- Double-click on **System Setup**
- Double-click on **Spooler**
- Click on the **Redirection** tab

- Click on the down arrow to display the ports
- Click on a port in the list
- Click on a printer in the list
- Close Properties

4.4.7 Deleting a Printer Port

To delete the object that represents a port:

- Display the pop-up menu for the printer object
- Click on **Properties**
- Click on the **Output Port** tab
- Display the pop-up menu for the port that you want to delete
- Click on **Delete**
- Close Properties

If this port is selected for any other printer objects, a window appears showing those objects. For each printer object identified, display the Output Port page in its Properties and select a different port.

4.5 Queue Drivers

The OS/2 installation process automatically installs the PMPRINT queue driver (also called a queue processor) on your system.

To install additional queue drivers:

- Display the pop-up menu for the printer object
- Click on **Properties**
- Click on the **Queue options** tab
- Display the pop-up menu for the queue driver
- Click on **Install**
- Insert the diskette containing the queue drivers in drive A
- Click on **Refresh**
- Click on one or more new queue drivers from the Queue driver field
- Click on **Install**

Most systems use a queue driver named PMPRINT. If you install other queue drivers (such as PMPLOT), you should change the queue driver specified on the printer object. The Printer Properties - Queue Driver window is shown in Figure 113 on page 248.

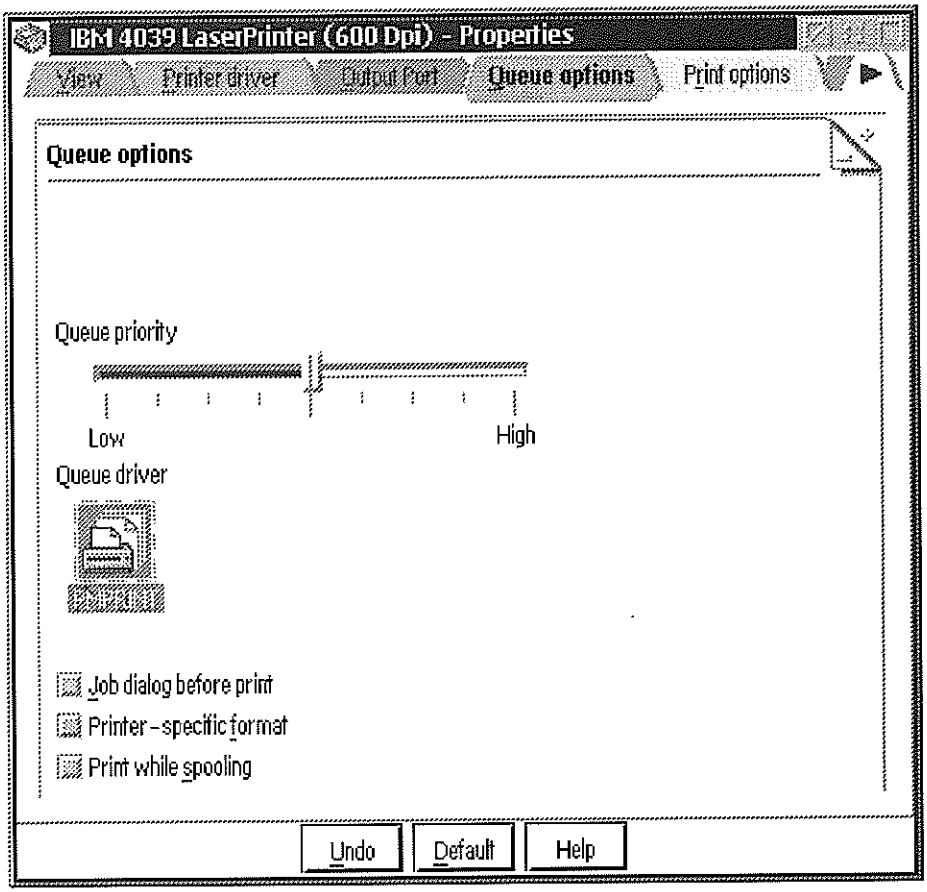

Figure 113. Printer Properties - Queue Driver Window

To change the queue driver:

- Display the pop-up menu for the printer object
- Click on **Properties**
- Click on the **Queue options** tab
- Click on the object that represents the new queue driver
- Close Properties

After you install a driver, it appears highlighted in the Queue driver field. Some queue drivers will allow you to change the properties that describe their setups.

4.5.1 Managing a Print Queue

Since you can run multiple applications at the same time on your OS/2 Warp 4 system, you can also print from more than one application at the same time. Obviously, this is going to cause some problems if you only have one printer, but OS/2 Warp 4 overcomes these problems by placing print jobs in queues and then passing them to the printer, one at a time.

You can view your print queues and manipulate your print jobs using the printer objects in your Workplace Shell. To display the jobs that are currently waiting to be printed, open the printer object by double-clicking your left mouse button on its object. Figure 114 shows an open printer object with two print job objects in its queue.

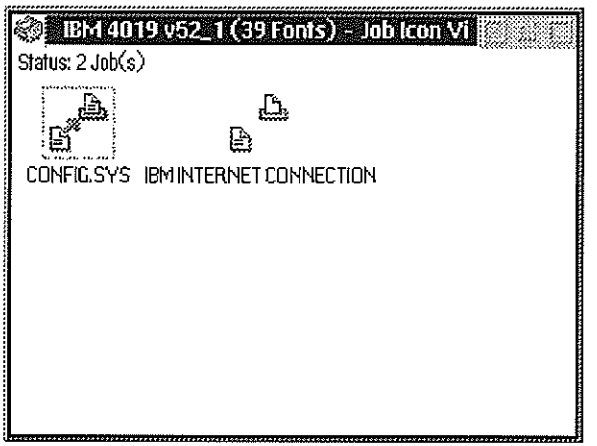

Figure 114. Open Printer Object Window

The print job objects shown in Figure 114 each have their own context menus, from which you can control the individual jobs. Each print job also has a Properties notebook that can be accessed from the context menu, to give you additional information about the print job. For example, if you are looking at the Properties notebook for a LAN-attached printer, you can see the name of the user who submitted each print job.

You can view the contents of print jobs in the queue. If you double-click your left mouse button on a print job object, OS/2 Warp 4 will attempt to load the print job into its text editor. If the print job contains binary code such as graphics, rather than text, you will receive a warning message and you can cancel this request.

4.5.2 Delete a Queue Driver

To delete the object that represents a queue driver:

- Display the pop-up menu for the printer object

- Click on **Properties**
- Click on the **Queue options** tab
- Display the pop-up menu for the queue driver that you want to delete
- Click on **Delete**
- Close Properties

If this queue driver is selected for any other printer objects, a window appears showing those printer objects. Display the Queue Options page in the Properties notebook for each printer object identified and select a different queue driver. If a pending print job needs the queue driver, the Delete option does not appear on the pop-up menu for the driver.

4.5.3 Reverse Clipping

Reverse clipping removes hidden lines and patterns from solid objects that overlap in a picture, so that objects that lie beneath other objects in the viewing plane do not appear in the output. Reverse clipping reduces the number of points on the page, lessening wet-ink smearing and extending the life of your plotter pens.

If your plotter is capable of reverse clipping and your plotting program does not already do the clipping for you, you can enable reverse clipping for a printer object. To do so:

- Create a copy of a printer object
- Display the pop-up menu for the new printer object
- Click on **Properties**
- Click on the **Queue options** tab
- Display the pop-up menu for a queue driver
- Click on **Install**

The Install New Queue Driver window is displayed. In the Directory field, type:

```
E:\OS2IMAGE\PMDD_1
```

where E: is the OS/2 Warp 4 CD-ROM drive.

- Click on **Refresh**
- Click on **PMPLOT**
- Click on **Install**
- Click on **Close**

You will now be returned to the Queue driver properties

- Select **PMPLOT**
- Close Properties

Reverse clipping requires an additional printer driver (PMPLOTPD.DRV), which is automatically installed by OS/2. PMPLOT relies on your regular plotter driver to determine plotter properties, such as pen setup, but calls PMPLOTPD.DRV to perform clipping analysis.

4.6 Printer and Plotter Properties

A printer driver has printer properties, which describe the way your printer is physically set up. You can change these properties manually in the Properties of the printer driver object. If you are using an intelligent printer, you can enable OS/2 to set the printer properties to the configuration of the printer.

4.6.1 Changing Printer and Job Properties

You can have many printer objects on your desktop, each representing a different printer. However, you can also have more than one printer object for a single printer, with each object having a different printer setup. For example, you might have two printer objects for one printer, with one set up to print on letter-size paper and another set up to print envelopes.

4.6.2 Printer Properties

The following are examples of printer properties:

- Type of paper feed (tractor or bin)
- Number and location of paper trays
- Forms loaded in the paper feed or trays
- Font cartridges loaded on the printer
- Installed soft fonts
- Resolution, orientation, and compression

The number and kind of properties available depend upon the type of printer that you have.

4.6.3 Plotter Properties

The following are examples of printer properties for plotters:

- Type of paper feed (manual, automatic, preloaded)
- Orientation (portrait, landscape)
- Size of paper
- Number of carousels
- Active carousel
- Color and type of each pen in a carousel
- Color sorting (completing all lines that require one color pen before changing pens)

The number and kind of properties available depend upon the type of plotter that you have. The Printer Driver Properties window is displayed in Figure 115 on page 252.

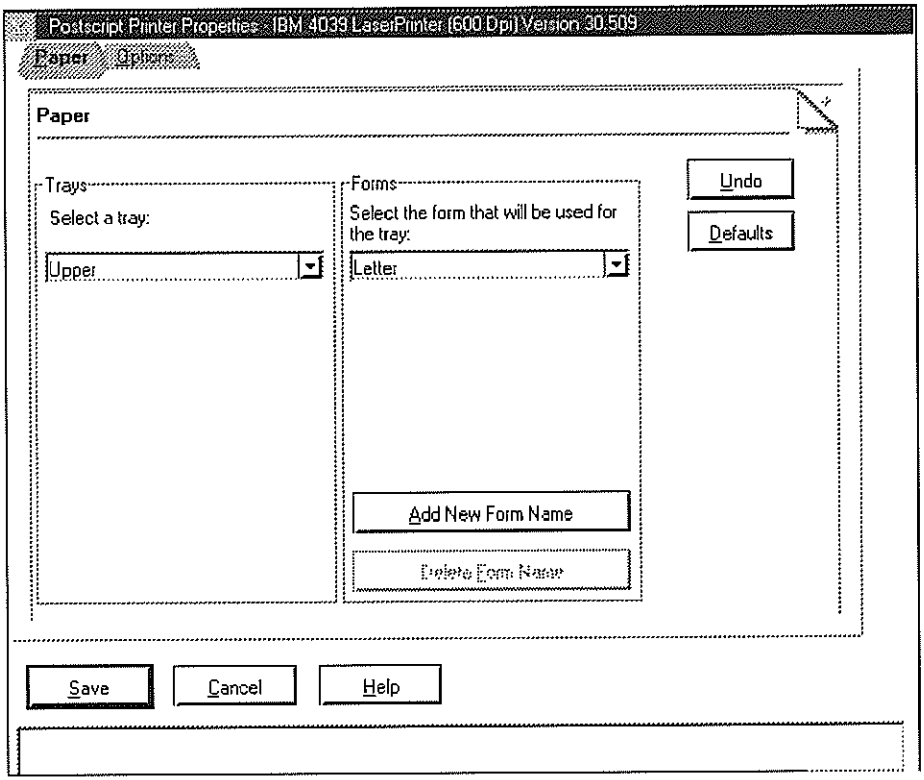

Figure 115. Printer Driver Properties Window

4.6.4 Setting Printer Properties

To set printer properties:

- Display the pop-up menu for the printer driver object
- Click on **Properties**
- Click on the **Printer driver** tab
- Display the pop-up menu for the printer driver object
- Click on **Properties**
- Change the properties to match your printer setup
- Click on either **OK** or Save

- Close Properties

Your printer object is now set up to print a job.

4.6.5 Installing and Removing Printer Fonts

Use the printer properties to install fonts for your printer. To install the cartridge or soft fonts for a particular printer, or to remove printer fonts from your system:

- Display the pop-up menu for the printer object.
- Click on **Properties**
- Click on the **Printer driver** tab
- Display the pop-up menu for the printer object
- Click on **Open as**
- For HP LaserJet or PostScript printers, click on **Fonts**
- For IBM Laser Printers, click on **Download Fonts**

A window appears in which you can list the fonts for your printer and select those you want to install. The remaining steps depend upon the printer driver you use. For additional information, click on **Help** after the window is displayed.

4.6.6 Set Formatting Options for Plain Text Files

You can set up a printer to format plain-text files printed on it. To select the text formatting options for a printer:

- Display the pop-up menu for the printer object
- Click on **Properties**
- Click on the **Text format** tab
- Click on a formatting option you want to set
- Select the value of the formatting option
- Continue until you have set all the formatting options
- Close Properties

4.6.7 Change a Printer Form

If a form specified for a specific job does not match the form specified for the physical setup of the printer, the job has a status of Forms mismatch and will not print. To print this job, you must change the printer properties to match the job properties. Printer properties describe the physical setup of the printer. Job properties describe the requirements for a particular job. To change a printer form:

- Display the pop-up menu for the printer object
- Click on **Properties**

- Click on the **Printer driver** tab
- Display the pop-up menu for the printer-driver object
- Click on **Properties**
- Change the form setup to match the new printer setup
- Close Properties

If necessary, change the paper in the printer to match the form required by the job properties.

4.6.8 Intelligent Printer

OS/2 Warp 4 uses two-way communication to receive the status and configuration of an intelligent printer and to manage the printer and its print jobs. Intelligent printers connect to a parallel port, an infrared port, and a network card. OS/2 fully supports intelligent printers connected to the network or to an infrared port.

You can set the properties of a local or network printer object to the actual configuration of the intelligent printer assigned to the object. To set the printer properties:

- Display the pop-up menu for the printer object
- Double-click on **Properties**
- Click on the **Printer driver** tab
- Double-click on the highlighted printer driver
- Click on either **Auto Configure** or **Update**
- Click on **OK** or **Save**
- Close Properties

4.7 Job Properties

Print jobs have job properties, which describe how to print the data file (document) or plot the image. You can view the properties for a print job and, in some cases, make changes before the job prints.

Job properties describe the following requirements for printing a job:

- Form needed for the job
- Character size
- Paper orientation (portrait or landscape)
- Graphic resolution (dots per inch)
- Scaling (percentage of enlargement or reduction)
- Paper-feed method (manual or automatic)

- Type of output (single-sided or double-sided)
- Binding edge and method of flipping
- Color or black-on-white
- System-font downloading (for faster output)

The Job Properties window is displayed in Figure 116.

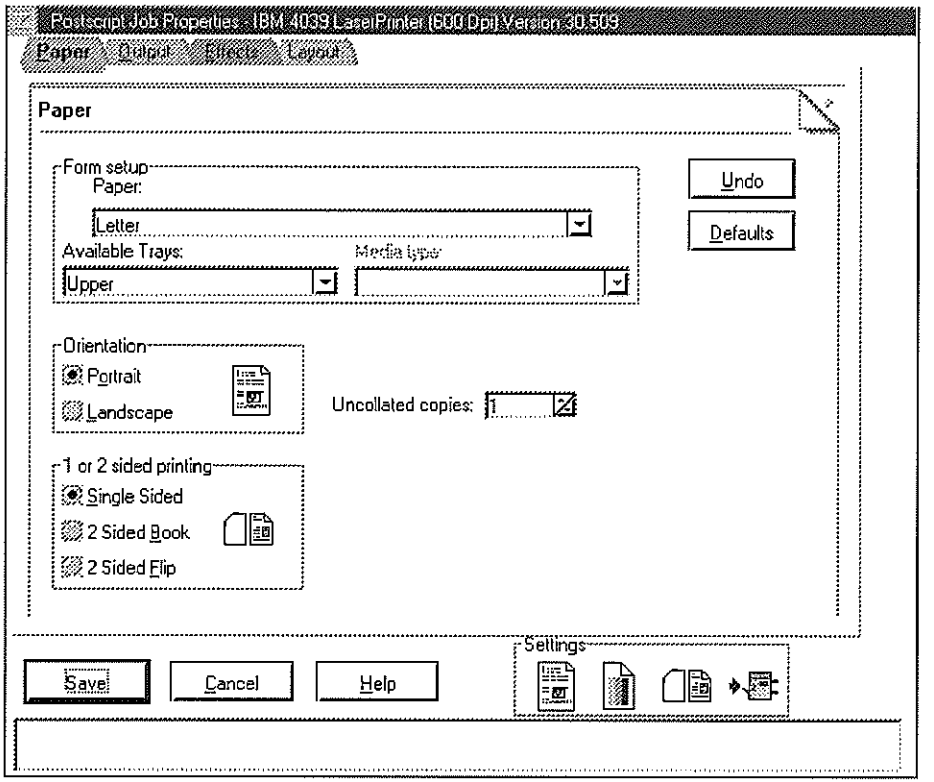

Figure 116. Job Properties Window

4.7.1 Default Job Properties

You can set up your printer so that it uses the same job properties for each job without prompting you for input. Use these default job properties to:

- Print from a command prompt
- Print from a DOS program

Default job properties do not allow you to:

- Specify job properties through a program
- Specify job properties immediately before printing an individual job

To set default properties for your print jobs:

- Display the pop-up menu for the printer object
- Click on **Open as**
- Click on **Job properties**
- Click on the appropriate properties
- Click on **OK**

A printer driver has job properties or device defaults associated with it. The device defaults provide a basis for the properties you adjust in the printer object or your program. You can adjust these device defaults for some printer drivers. To set default job properties for a printer driver:

- Display the pop-up menu for the printer driver object
- Click on **Properties**
- Click on the **Printer driver** tab
- Select the Printer Driver
- Click on **Job Properties**
- Click on **Default**
- Click on the appropriate properties
- Click on **OK** or **Save**
- Close Properties

4.7.2 Prompting for Job Properties

To have the system prompt you for job properties each time you print from the Desktop:

- Display the pop-up menu for the printer object
- Click on **Properties**
- Click on the **Queue options** tab
- Click on **Job dialog before print**
- Close Properties

Each time you drag and drop a job on a printer object, a window will appear in which you can select the job properties. This feature will not work when printing from an OS/2 program, command line, DOS session, or WIN-OS/2 session.

4.7.3 Job Properties from Within a Programs

Some programs allow you to select the job properties from within the program. Most of these programs have a menu that contains a printer setup choice.

4.7.4 Properties to Be Displayed in the Details View

You can select the print job details you want to be displayed when you open a printer object in the details view. To select the details to be displayed:

- Display the pop-up menu for the printer object
- Click on **Properties**
- Click on the **View** tab
- Click on the details you want to display
- Close Properties

To view the details of the jobs queued on a printer:

- Display the pop-up menu for the printer
- Click on **Open as**
- Click on **Details view**

4.8 The Spooler

You may have multiple printers on your OS/2 Warp 4 system, and print from multiple applications at the same time. To manage all this printing activity, OS/2 Warp 4 contains a component known as the *spooler*. The spooler manages all the print jobs pending on your system. When you print a file or document, OS/2 Warp 4 creates a *spool file* containing the print job, and places it in a directory known as the *spool path*. When the required printer becomes available, the print job is routed to the printer and when it has been printed, the spool file is deleted automatically.

You can control the operation of the spooler using the Spooler object, which is found in the System Setup folder within the OS/2 System folder. When you open the **Spooler** object, OS/2 Warp 4 displays a notebook like that shown in Figure 117 on page 258.

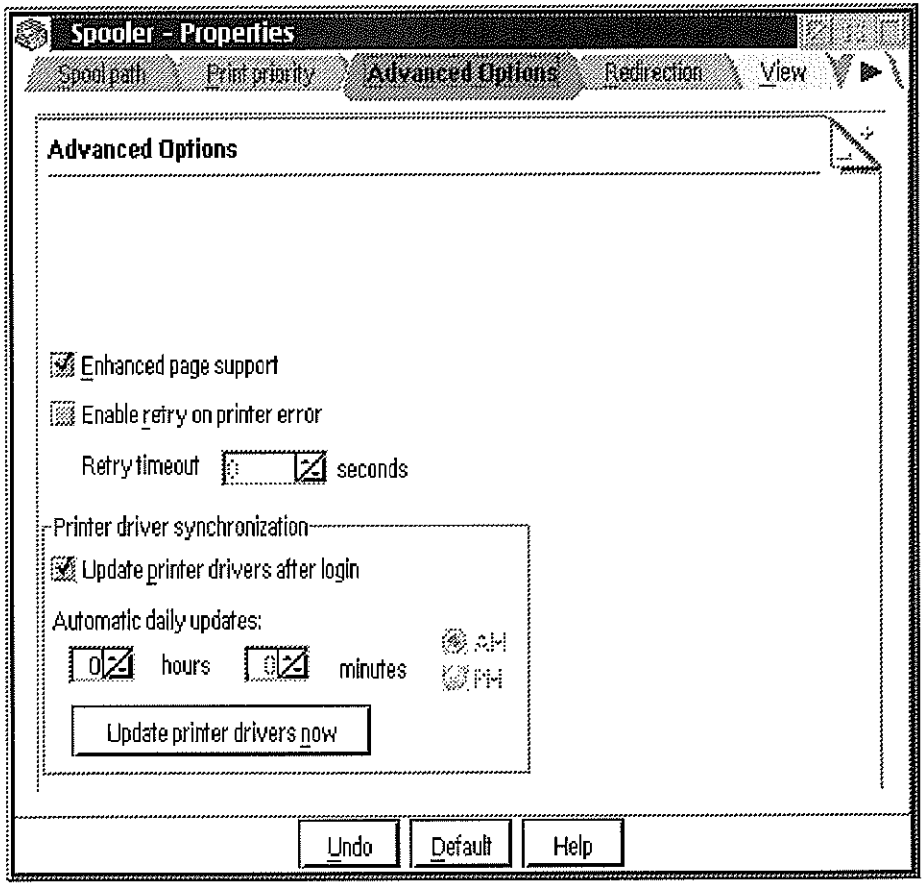

Figure 117. Spooler - Properties Window

This notebook allows you to change settings such as the location of the spool path, the default priority of print tasks in your system, and so on.

Part 2. Connectivity

Introduction to OS/2 Warp 4 Connectivity

OS/2 Warp 4's strength is in its connectivity, which is unequalled in the marketplace. It has the widest array of connectivity choices available today. Only OS/2 Warp 4 has the capability to provide so many communications connections simultaneously. It can be used on a single, stand-alone system, in a peer network, or in a server network. This part discusses the installation, configuration, and administration of the OS/2 Warp 4 connectivity features including configuration of TCP/IP for the Internet environment, configuration and connection to various network operating systems, configuring of remote clients, and connection to 3270 and 5250 host systems.

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Chapter 5. Network Capability of OS/2 Warp 4

OS/2 Warp 4 provides the following range of networking components that allow you to connect to local area networks (LANs) and to the Internet:

- **File and Print Client**

  With this component, you can log on to a peer network or IBM LAN Server domain, and use shared applications, directories, modems and printers on servers and peer workstations. The File and Print Client (if you install using the Advanced installation) allows you to install the graphical user interface of IBM LAN Server 4.0 or IBM Warp Server, so that you can graphically administer IBM LAN Server domains.

  To operate on a peer network and share your files and printers, or to access such resources on other peer workstations, all you need do is select the **Share** option. This allows you to share directories, printers and modems on your workstation with other users on the network who are running File and Print Client, IBM LAN Requester, IBM LAN Server, or other compatible peer networking software such as Microsoft Windows for Workgroups or Windows 95.

  You can use any or all of these File and Print Client functions concurrently.

- **Novell NetWare Client**

  The Novell NetWare Client lets you log in to Novell NetWare servers and access directories and printers on those servers.

- **TCP/IP Services**

  OS/2 Warp 4 provides you with a full suite of applications that allow you to access the Internet, the largest and fastest growing network of computers and users in the world. OS/2 Warp 4 provides all the major communication protocols, tools and utilities that you are likely to need for connecting to the Internet via a LAN or a standard telephone link.

  Since the Internet is essentially a very large TCP/IP network, you can use these same tools and utilities to connect to other systems on a local area network using the TCP/IP protocol; for example, you can access any UNIX-based systems in your networking environment.

- **Remote Access Client**

  The Remote Access Client lets you dial into your LAN using a standard telephone link. For example, if you are travelling and carrying a laptop computer with OS/2 Warp 4 and the Remote Access Client installed, and you have access to a supported modem and a telephone line, you can use LAN client software such as the File and Print Client or Novell NetWare Client to transparently connect to your LAN or connect to other workstations using Remote Access Client. Your LAN administrator will need to set up a LAN Distance Connection Server or IBM Warp Server to allow you to connect to the LAN.

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The Remote Access Client is typically used on laptop computers with a modem, but you can use it on any OS/2 Warp 4 system. For example, you may use the Remote Access Client on your home computer to access your office LAN.

- **Mobile Office Services**

  Mobile Office Services allows you to select files from the LAN, place then onto your mobile computer, disconnect from the LAN and then work with those files while travelling. You can read or modify existing files, create new files and directories, or delete existing ones. Reconnecting to the server automatically updates the server with any new files or directories added. It also updates changes to existing files performed at the client, and provides extensive conflict detection and resolution of any files changed on either the server or the client. Mobile Office Services is run from the client only and does not require any changes or additional software on your servers.

- **System Management Client**

  The System Management Client in OS/2 Warp 4 consists of many functions to give administrators powerful utilities to manage workstation resources.

  In a network environment where systems management is performed by a network administrator using remote management tools over the network, OS/2 Warp 4 lets you choose several industry-standard interfaces and protocols such as the Desktop Management Task Force's Desktop Management Interface (DMI), the SNMP Distributed Protocol Interface (DPI) subagent and the Tivoli TME 10 NetFinity Client. Support for these protocols allows your network administrator to choose from a wide variety of administration tools in order to administer your OS/2 Warp 4 system.

  To make it easier for you to diagnose and report problems on your OS/2 Warp 4 system, OS/2 Warp 4 provides functions to read and format system dumps, and keeps the addresses of main data structures to avoid the need for OS/2 symbol files. The FFST/2 subsystem now offers the ability to capture all data relevant to an error at the time it occurs.

Each of the major network components of OS/2 Warp 4 is described in detail later in this book. However, OS/2 Warp 4 also provides a number of additional facilities that will be useful in a network environment.

The Security Enabling Services (SES) provides an application programming interface for specialized security applications. OS/2 Warp 4 also provides a local security function to enable customized access to a workstation for different users.

5.1 Installing OS/2 Warp 4 Network Components

You can choose whether or not you want to install all or some of the networking components on your OS/2 Warp 4 system. If you do decide to install them, you can perform the installation in two ways:

1. During the installation of OS/2 Warp 4

When you install OS/2 Warp 4 on your system, you are asked what networking components you want to install. Note that the choices you will have at this time are affected by whether you selected the **Easy** or **Advanced** installation options when commencing OS/2 Warp 4 installation.

2. After you have installed OS/2 Warp 4

   You can add any or all of the networking components at a later time, using the Selective Install for Networking utility (see 5.1.5, "Installing Individual Networking Components" on page 304 for more information).

As with the OS/2 Warp 4 operating system itself, you can choose to install the networking components locally using the OS/2 Warp 4 CD-ROM (see 5.1.1, "Installing Directly from the CD-ROM") or to install them remotely over a LAN (see 5.1.4, "Installing Remotely on the LAN" on page 303). You can use either of these methods, regardless of whether you are installing the networking components during OS/2 Warp 4 installation or separately at a later time. The choices you are given during installation will be the same for both methods.

You can also build separate installation diskettes for each networking component, and then use these diskettes to install the component locally onto any target machine (see 5.1.8, "Using Individual Product Installation Diskettes" on page 305).

5.1.1 Installing Directly from the CD-ROM

The default method of installing the networking components, as with the OS/2 Warp 4 operating system, is to use the OS/2 Warp 4 CD-ROM. Since the installation of the networking components is integrated into the OS/2 Warp 4 installation procedure, you do not need to do anything to start installing the networking components; it will happen automatically during OS/2 Warp 4 installation.

If you decide to install only part or none of the networking component, you can go back later and install through Selective Install for Networking or type `NPCONFIG` in the IBMINST directory on the OS/2 Warp 4 CD-ROM to start it. After starting Selective Install for Networking, you will be asked if you want to choose the **Easy Installation** or the **Advanced Installation**.

Differences between Easy and Advanced Installations

Apart from the obvious difference that the Easy installation is easier to install than Advanced, there are some components that cannot be configured with the Easy option and can be installed only with the Advanced option:

- Installation of the LAN Server Administration utilities.
- Configuring more than one network adapter within the installation.
- Advanced allows more detailed configuration of the Novell NetWare Client, System Management Client and LAN Adapter and Protocol Support (LAPS).

5.1.2 Easy Installation

If you select the **Easy** installation option, OS/2 Warp 4 will guide you with individual installation questions for all networking components.

The Easy installation option initially lets you choose between a number of installation paths, as shown in Figure 118.

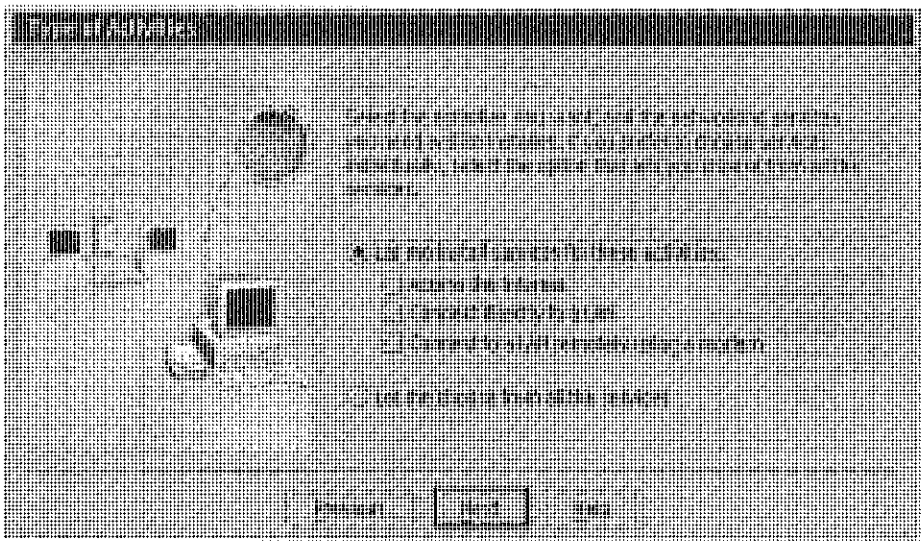


Figure 118. Easy Installation - Type of Activities

Use this window to select the types of networking activities you want to perform with your OS/2 Warp 4 system. Based on the selections you make, you will be asked for more information in the windows that follow.

If you select **Let me install services for these activities**, you can then select from the three types of networking activities below this radio button. Note that these activities are *not* mutually exclusive, so you can select more than one option. Selecting any of these three activities causes different networking components to be installed on your system, and each component allows you to accomplish particular tasks. The tasks from which you can choose are:

- Access the Internet

  In summary, this installs TCP/IP services for modem access. Select this option if you want to connect to the Internet, which lets you access resources worldwide and communicate with users anywhere in the world. You can send and receive electronic messages, transmit files, or connect to online bulletin boards called newsgroups.

- Connect directly to a LAN

  Select this option if you want to install the File and Print Client. With the File and Print Client, you can share resources (such as files and printers on your system) with other users on a LAN and you can use resources on other workstations as if they were on your own system. You can also use the File and Print Client to access IBM LAN Server, IBM Warp Server or Windows NT servers.

  If you select this option, you will be presented with a number of other windows to enter information such as a name for your workstation, a domain name for the group of users whose resources you use most frequently, and a user ID for logging on. You will also be asked whether you want to install support for using resources on Novell NetWare servers.

  Choose this and the above "Internet" if you want to run TCP/IP over the LAN.

  The installation procedure also verifies and configures the network adapter that is installed in your computer. This is done automatically by the installation procedure.

- Connect to a LAN remotely using a modem

  Select this option if you want to use your computer to:

  - Dial in to a LAN and use LAN resources from another location
  - Take LAN-based files with you to another location, work on the files, and automatically update them on your LAN when you return

  If you select this option, you can install File and Print Client, Remote Access Client and Mobile Office Services. You will also be asked whether you want to install Novell NetWare Client for using resources on Novell NetWare servers. The installation program also verifies and configures the network adapter that is installed in your workstation.

If you select **Let me choose from all the services**, you will be guided through a number of windows with questions about all the available services in the Easy installation path. Since this is the preselected choice in the Type of Activities window, and requires you to answer all the installation questions, we will describe these steps in detail now.

The first panel you will see is the File and Print Client window, as shown in Figure 119 on page 266.

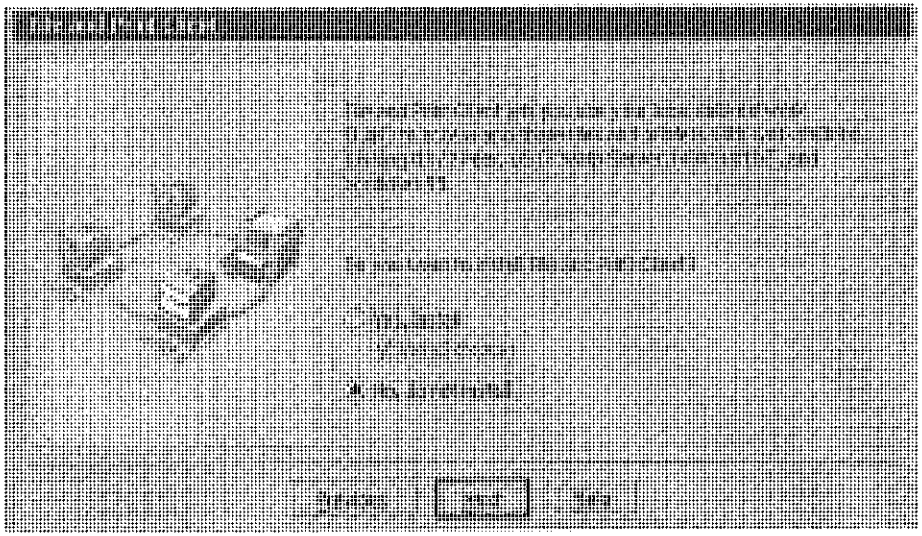


Figure 119. Easy Installation - File and Print Client

This window explains the function of the File and Print Client, and asks you if you want to install it.

Select **Yes, install** if you want to install the File and Print Client. If you also want to allow users on other workstations to use files, printers, serial devices, and applications on your workstation, select **Install sharing**.

Select **No, do not install** if you do not want to install File and Print Client. You will then avoid the windows that configure the File and Print Client and proceed directly to the Novell NetWare Client as shown in Figure 124 on page 271.

If you select **Yes, install**, you will see another window as shown in Figure 120 on page 267.

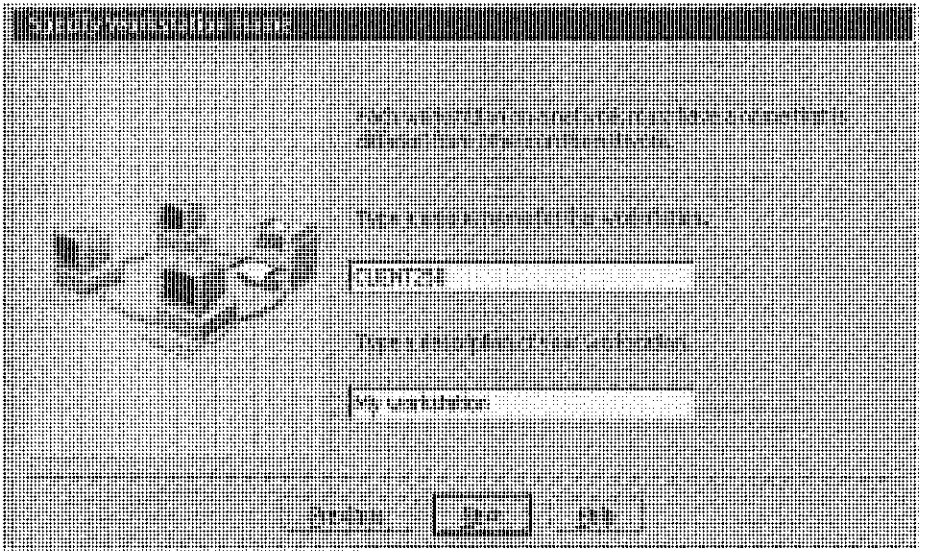


Figure 120. Easy Installation - Specify Workstation Name

This window asks you to specify a workstation name, by which your computer will be identified on the network. If you want to use a name that is different from the one displayed, type 1 to 15 alphanumeric characters in the space provided. The workstation name must not be the same as the name of any other workstation, or any domain, on the network.

In a large network, your network administrator can help you select a unique name. You can also supply a description for your computer. When you have entered the name and description, select the **Next** button to continue. You are now asked for a domain name, as shown in Figure 121 on page 268.

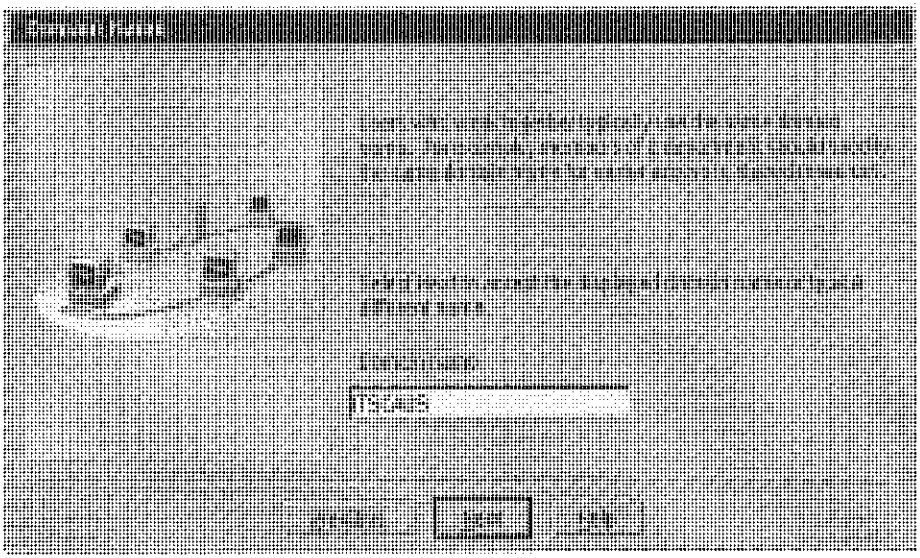


Figure 121. Easy Installation - Domain Name

If you have an IBM LAN Server, IBM Warp Server or Microsoft Windows NT Server domain on your network, use the name of that domain. If you have an OS/2 Peer or Microsoft Windows for Workgroups workgroup name, use that name. A more detailed discussion of network domains is given in 5.5, "Peer Networking" on page 382 and 5.3, "Accessing IBM Warp Server and Microsoft Windows NT Server" on page 342. When you have entered the name, select the **Next** button to continue.

The installation procedure will now present you with a window as shown in Figure 122 on page 269.

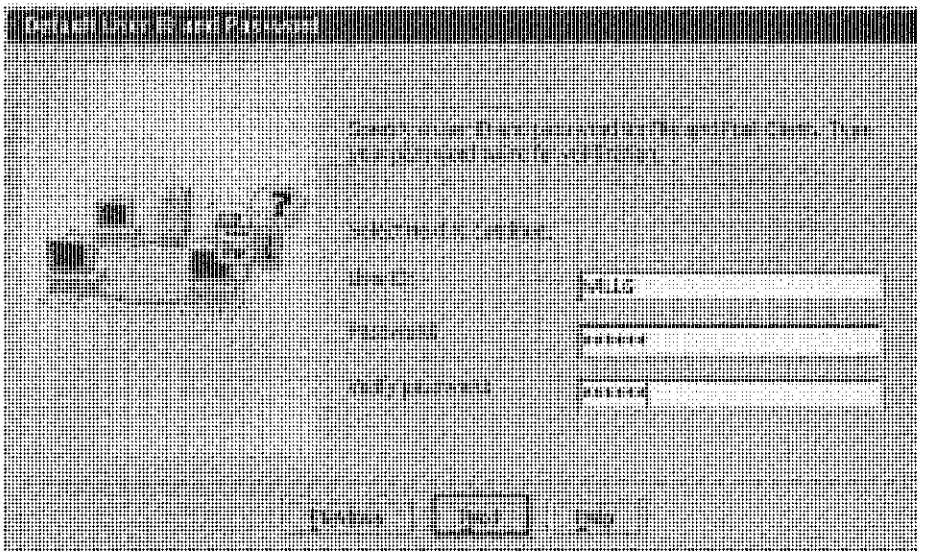


Figure 122. Easy Installation - Default User ID and Password

Use this window to specify a user ID and password that you will use to log on to the network. The letters are displayed when you type your user ID. To help keep your password secure, asterisks (*) are displayed when you type your password in the Password and Verify password fields. Your password should contain 4-15 characters. Your user ID should contain 1-20 characters and be unique on the network. It must not be the same as the name used for your workstation.

Note that this user ID is mandatory. In Figure 123 on page 270 you are reminded to record your user ID and password in a secure location because you will need this information to log on after you have completed installation.

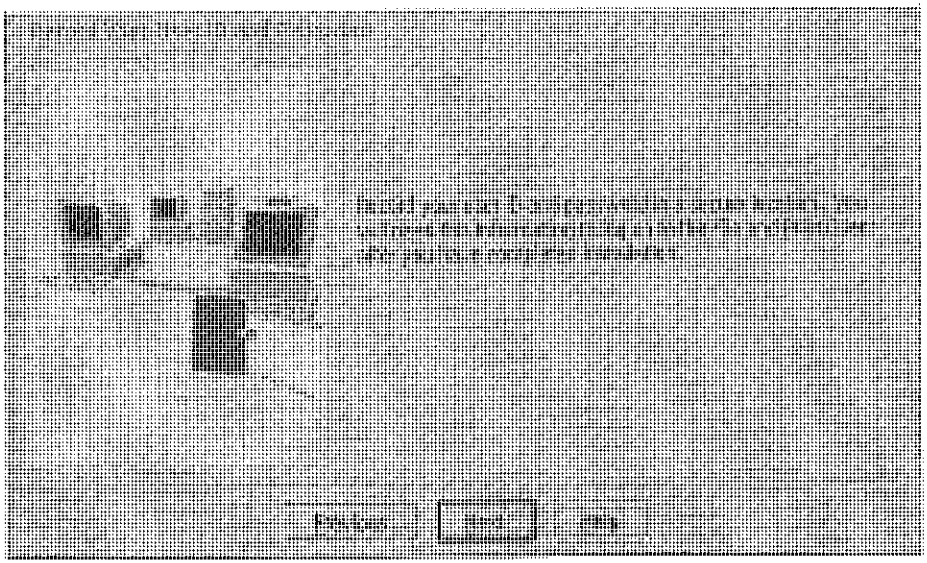


Figure 123. Easy Installation - Record Your User ID and Password

You will next be asked whether you want to install the Novell NetWare Client, as shown in Figure 124 on page 271.

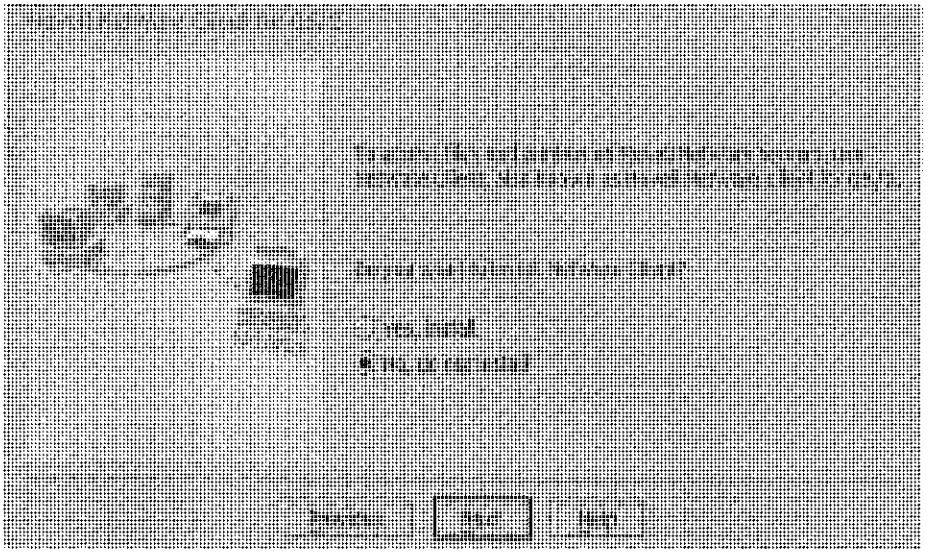


Figure 124. Easy Installation - Novell NetWare Client for OS/2

Select **Yes, install** to install the Novell NetWare Client or **No, do not install** to bypass this component, then select the **Next** button to continue.

If you selected to install the Novell NetWare Client you find yourself in the following panel:

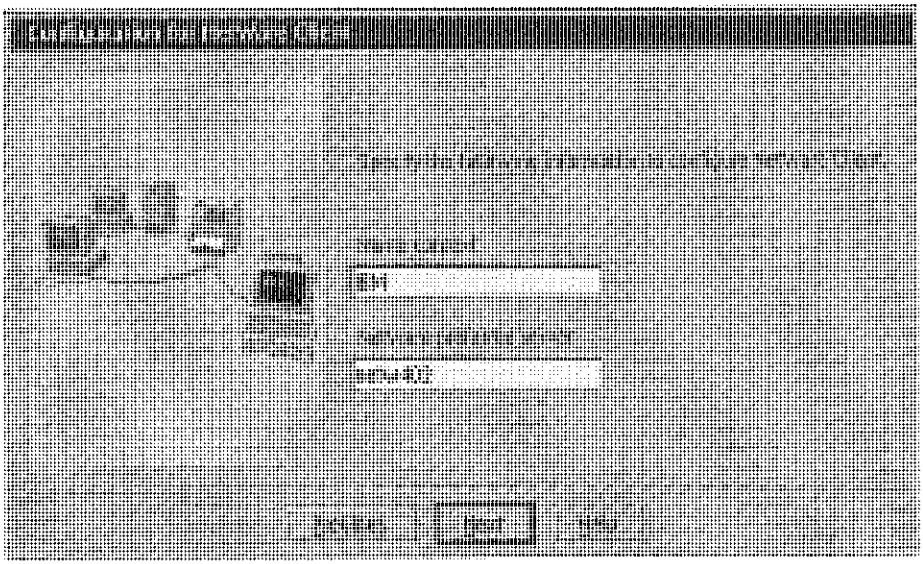


Figure 125. Easy Installation - Configuration for NetWare Client

In the Name context field, enter the name context for your NetWare 4.x Directory Service location. In the NetWare preferred server field, enter the name of a specific NetWare server to which you want to connect. If you do not specify a server in this field, the software will randomly connect you to a Novell server.

For more detailed information on NetWare 4.x Directory Services, name contexts and NetWare preferred servers, see 5.4, "Accessing Novell NetWare Servers" on page 355.

Next, you need to decide if you want to take your OS/2 Warp 4 system on the road.

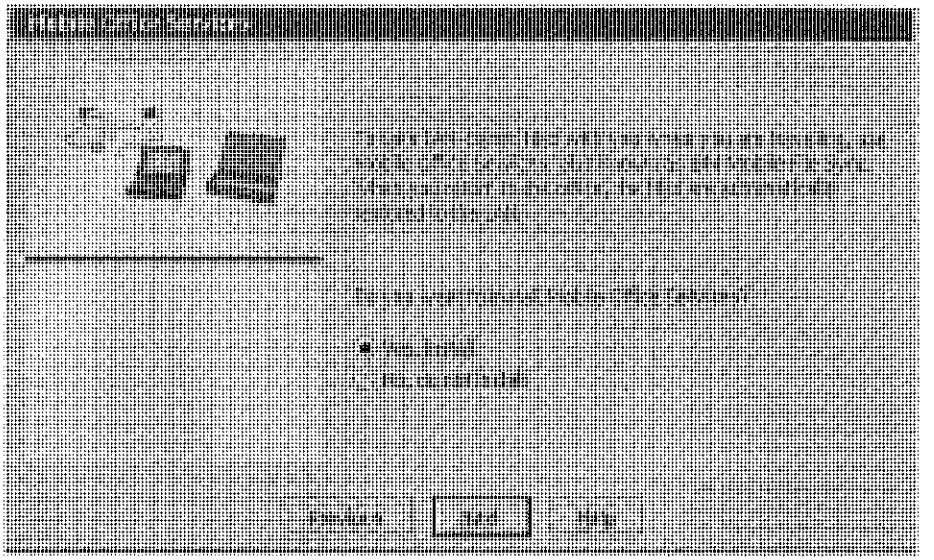


Figure 126. Easy Installation - Mobile Office Services

If you need to take LAN-based files with you when you are travelling, use Mobile Office Services. When you return to the office, the files you have worked on are automatically restored to the LAN. If this fits your needs, choose **Yes, install**. Otherwise, bypass this component by selecting **No, do not install**.

Using your OS/2 Warp 4 system in a network environment may require you to use some system management tools. OS/2 Warp 4 lets you install such tools using the window shown in Figure 127 on page 274.

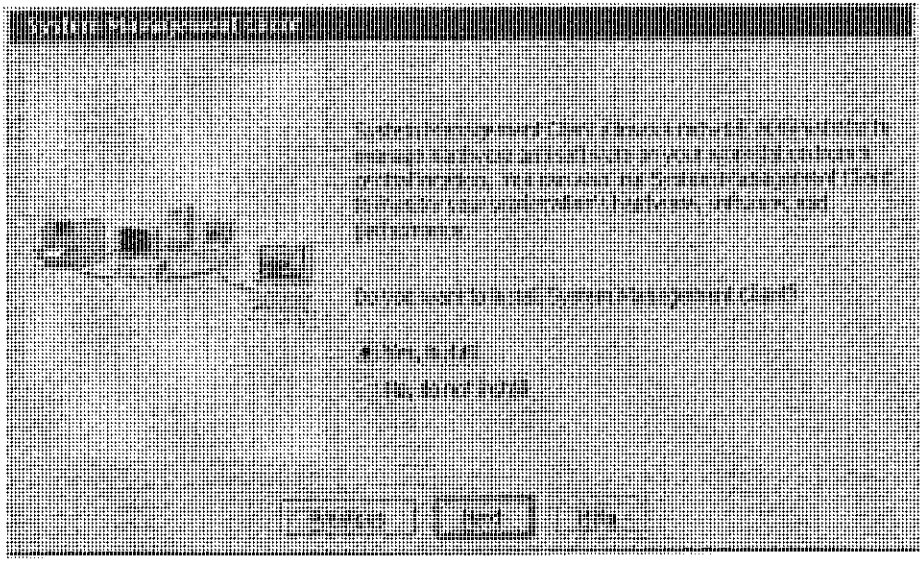


Figure 127. Easy Installation - System Management Client

Use this step to install the system management client on your workstation. The system management client allows a network administrator to manage the hardware and software on your computer from a central location. It also allows you to view information about your workstation and its performance.

Select **Yes, install** to install the system management client. Select **No, do not install** if you do not want to install the system management client.

Next, you are asked whether you want to install TCP/IP Services to access TCP/IP networks and the Internet. The installation procedure presents you with a window as shown in Figure 128 on page 275.

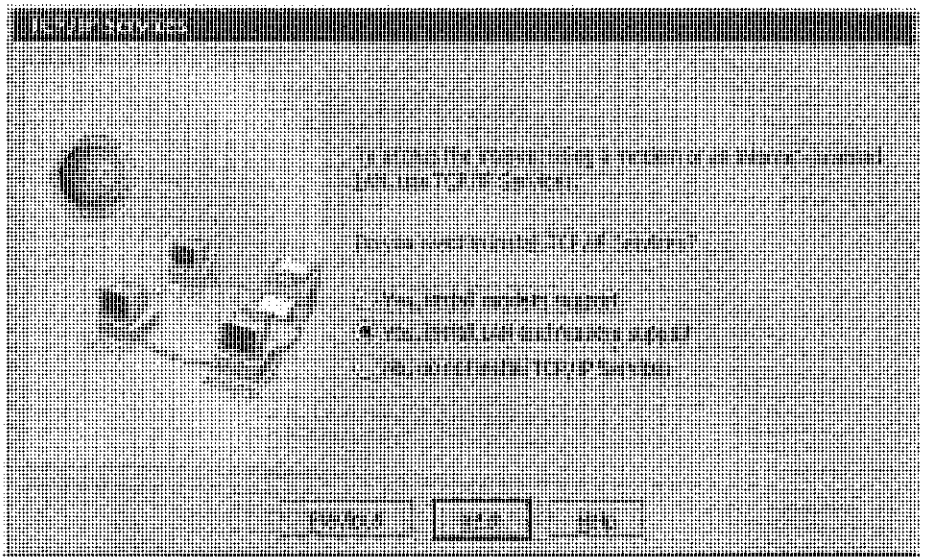


Figure 128. Easy Installation - TCP/IP Services

Select **Yes, Install modem support** if you will access the Internet through your modem. Select **Yes, Install LAN and modem support** if you will access the Internet through the LAN (you will still be able to get access via a modem as well).

Select **No, Do not install TCP/IP Services** if you do not need TCP/IP, Internet connection or the TCP/IP protocol.

To use TCP/IP Services over the LAN, you will need to obtain an Internet Protocol address and other configuration information. If your network uses a Dynamic Host Configuration Protocol (DHCP) server and a Dynamic Domain Name Server (DDNS), you do not need to configure TCP/IP Services because these servers automatically distribute TCP/IP settings to workstations attached to the network. You will be presented with a window as shown in Figure 129 on page 276. Note that this and the next configuration panel are selectable only if you selected **Yes, install LAN and modem support** for TCP/IP Services.

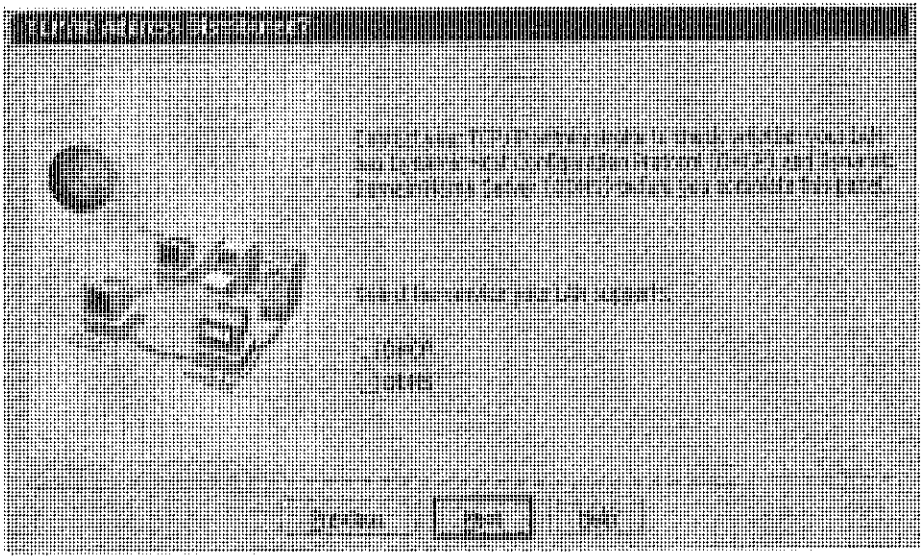


Figure 129. Easy Installation - TCP/IP Address Distributed ?

Select **DHCP** if a DHCP server is available to your workstation via the LAN. Select **DDNS** if a DDNS server is available to your workstation via the LAN. If you are unsure if your LAN has DHCP or DDNS, contact your network administrator.

If your network does not use DHCP and DDNS, you will need to obtain the correct configuration information from your network administrator, and enter this information in the window shown in Figure 130 on page 277.

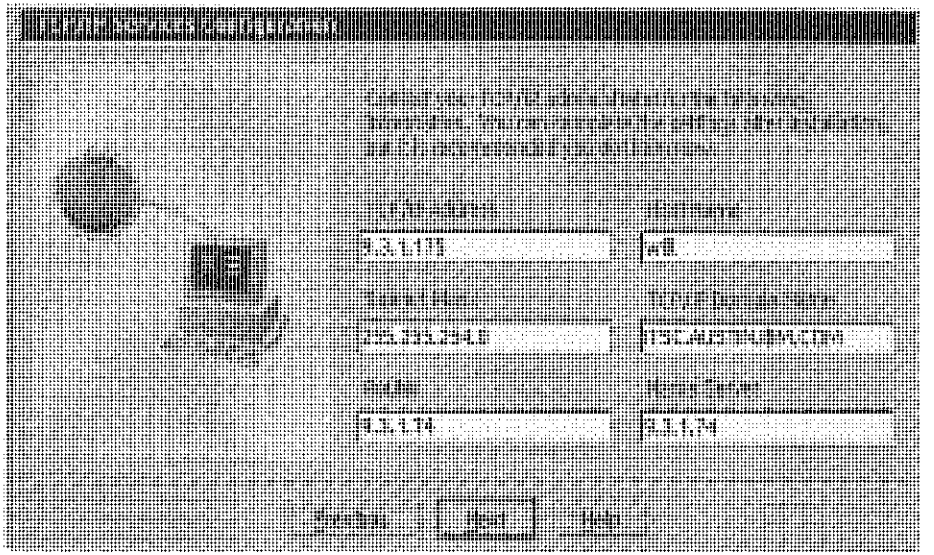


Figure 130. Easy Installation - TCP/IP Services Configuration

This TCP/IP configuration information is optional at this time, but you *must* configure TCP/IP after installation before you can use it. See your TCP/IP LAN administrator for help with configuring TCP/IP. Specify the following:

- IP address

  Your system's Internet Protocol address. An IP address has four numbers separated by decimal points. Each number can have 1 to 3 digits (for example, 127.40.99.100).

- Subnet mask

  The subnet mask used in your LAN, as provided by your network administrator (for example, 255.255.255.0).

- Router

  The IP address of your network router (for example, 129.35.96.1).

- Host Name

  Your system's name on the TCP/IP network (for example, "myhost").

- TCP/IP Domain Name

  This field is optional, and defines the name of the TCP/IP domain in which your system operates (for example, "mydomain.uc.edu").

- Name Server

The IP address of your network's domain name server (for example, 9.3.199.2).

Next, you must decide whether you want to install the Remote Access Client, which allows you to dial in to a server and use applications such as File and Print Client to access files, applications and printers over a telephone line. You make this decision using the window shown in Figure 131.

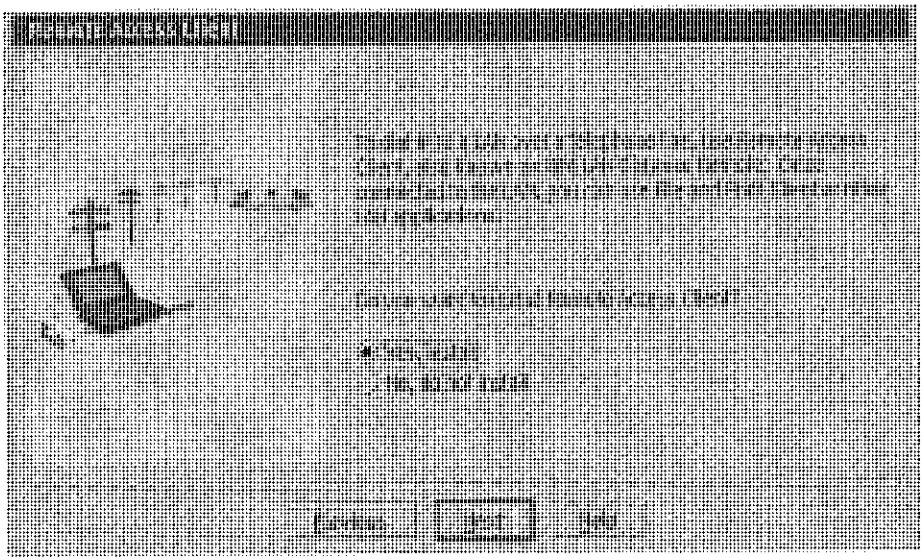


Figure 131. Easy Installation - Remote Access Client

Select **Yes, install** to install the Remote Access Client. Select **No, do not install** if you do not want to install Remote Access Client on this workstation.

You must now configure the Remote Access Client, by completing the fields in the following window.

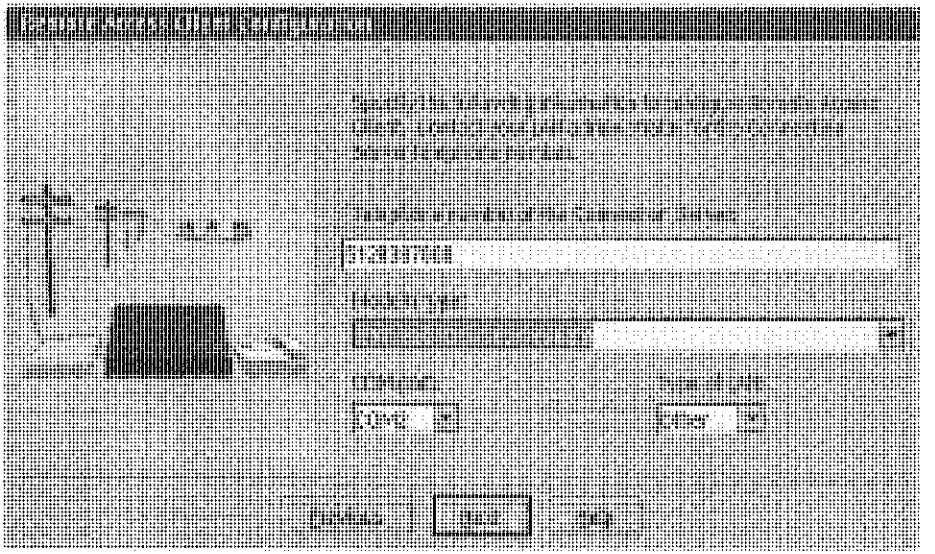


Figure 132. Easy Installation - Remote Access Client Configuration

Use this window to select the COM port and modem you will use to access the LAN, and to specify the telephone number for the connection server that connects you to the LAN. You must also select the type of LAN you will be using.

Note: Select **Other** in the Type of LAN field for token-ring.

To select a modem type, use the mouse to pull down the list of modems and highlight your selection. You can use the scroll bars to display parts of the list that are not visible.

Select **Next** to continue the installation. The installation procedure now displays the selected adapter, as shown in Figure 133 on page 280.

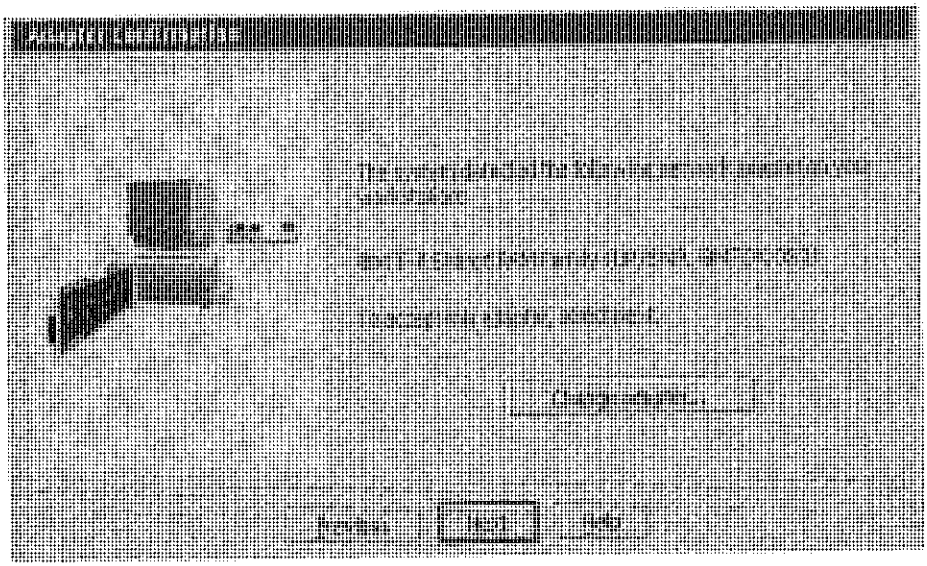


Figure 133. Easy Installation - Adapter Confirmation

If the adapter selected by OS/2 Warp 4 is correct, select the **Next** button.

However, if the adapter is not correct, you can click on the **Change adapter** button to bring up a list of supported adapters, as shown in Figure 134 on page 281.

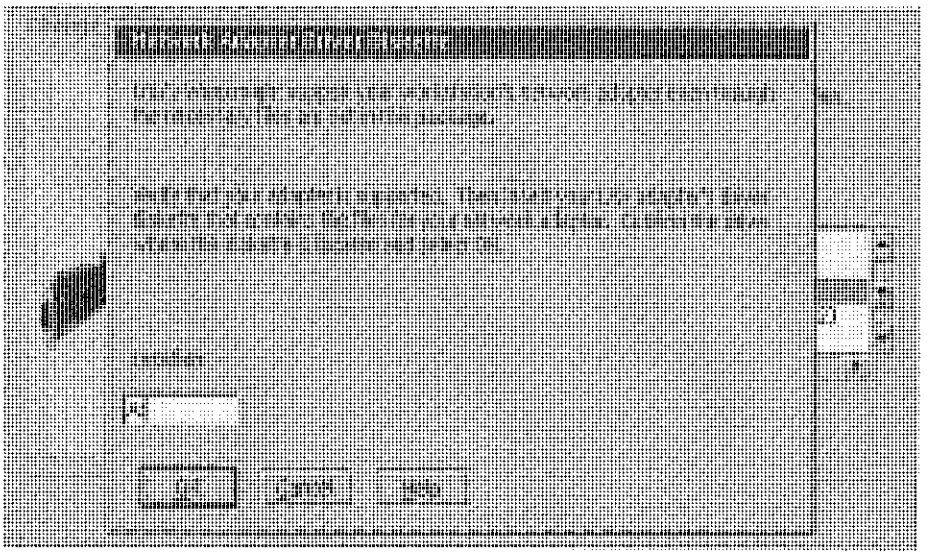


Figure 134. Easy Installation - Change Adapter

You can now select your adapter from the list. If your adapter does not appear in the list, the network adapter driver for it is not present on the OS/2 Warp 4 CD-ROM. This does not mean that you cannot use this adapter. It simply means that you need to obtain the driver for it from the manufacturer of the adapter or select a network adapter in the list that is similar to your network adapter. The device driver CD-ROM provided may also have your required driver.

When you have the driver available (usually on diskette), you can select the **Other adapter** button to load it into your computer. OS/2 Warp 4 will present the Network Adapter Driver Disk window, as shown in Figure 135 on page 282.

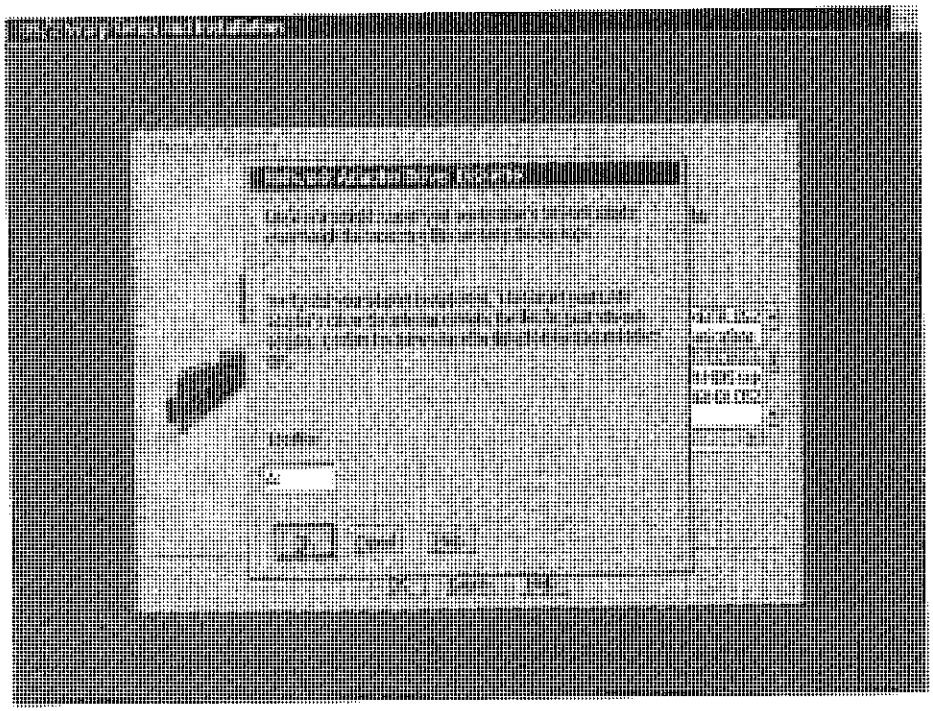


Figure 135. Easy Installation - Network Adapter Driver Diskette

When you insert the diskette into your diskette drive, and select the **OK** button from this window, OS/2 Warp 4 loads the network adapter driver and configures it for your system. You can now proceed with installation by selecting the **Next** button from the Adapter Confirmation window.

What If You Do Not Have a Network Adapter?

If you are installing networking components for remote access *only*, select the **No Network Adapter** entry in the list.

After you select the **Next** button, OS/2 Warp 4 presents you with a summary of the options you have chosen, and the drives on which they will be installed, as shown in Figure 136 on page 283.

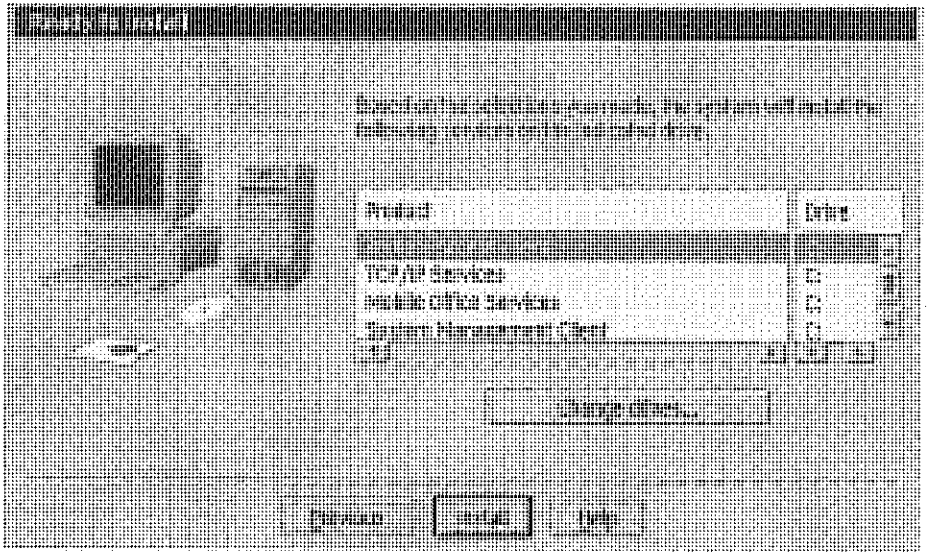


Figure 136. Easy Installation - Ready to Install

If you wish, you can change the installation drive for any networking component.

You are now ready to proceed with the installation. Select the **Install** button to begin.

At this point, the installation procedure installs the second part of the operating system, and the network components you have selected.

Installing NO Networking Components

If you selected none of the networking components within the Easy installation, OS/2 Warp 4 will only set up LAN Adapter and Protocol Support (LAPS) on your workstation.

5.1.3 Advanced Installation

The Advanced installation option gives you more control over the way that OS/2 Warp 4 sets up your networking components, but requires some additional networking knowledge on your part. The installation procedure provides you with many more options, some of which might be confusing if you are not familiar with local area networks and their terminology. If you are unsure how to respond to any of the questions presented to you, consult the online help guides or simply accept OS/2 Warp 4's defaults.

Note: Some items do not have default settings.

If you select the **Advanced** option, OS/2 Warp 4 presents you with the OS/2 Warp Setup and Installation window for the networking components, after you have completed the selection for the basic operating system components. This window is shown in Figure 137 on page 284.

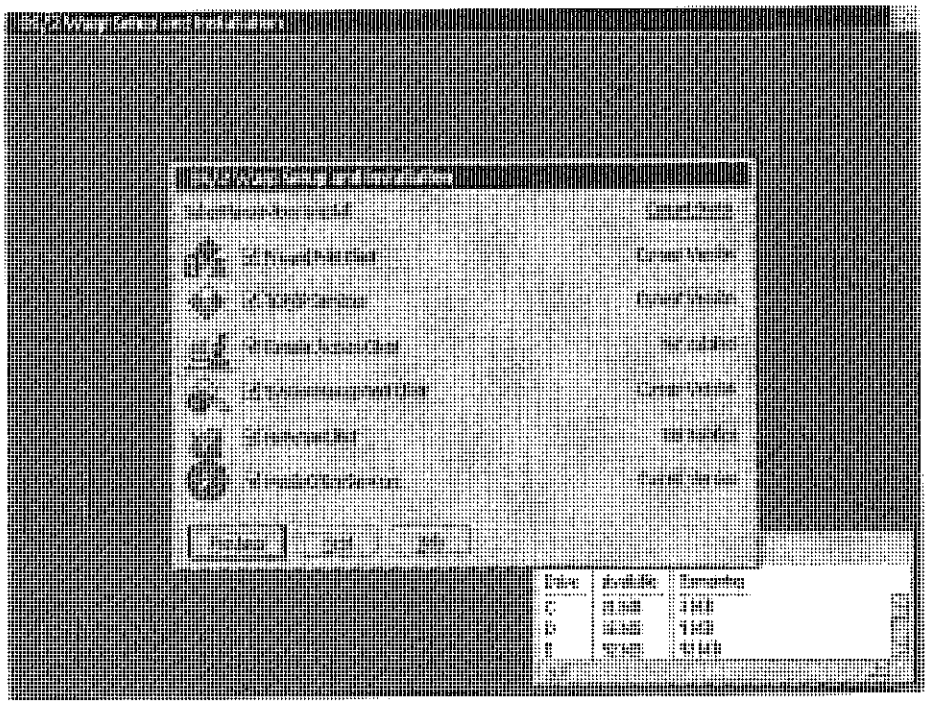


Figure 137. Advanced Installation - OS/2 Warp 4 Setup and Installation

Choose the networking components you want to install, by selecting the appropriate check boxes in the window, then select the **Next** button to continue. OS/2 Warp 4 will now prepare and display the Configuration window, depending on which components you have selected.

Note

Configuration windows for a particular networking component will be displayed only if you have selected that service in the OS/2 Warp 4 Setup and Installation window. Therefore, many of the configuration windows described on the following pages may not apply to your system.

The configuration window for your system will be similar to the one shown in Figure 138 on page 285.

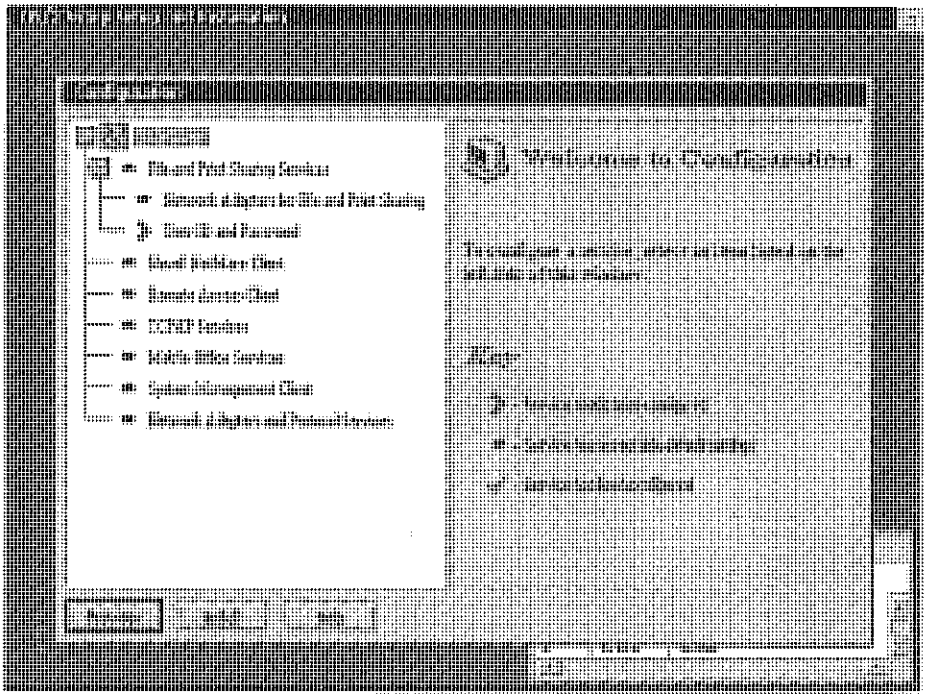


Figure 138. Advanced Installation - Configuration

Install Only after Configuring ALL Services

Do not select the **Install** button until you have completely finished configuring all the items that you want to install.

The Configuration window contains two sections:

- The smaller section on the left side of the window contains a list of items that you can configure. Select the items that you want to configure from this list. A green check mark next to an item means that the item is correctly configured; a red arrow means that the item must be configured; and a blue box means that the item is configured correctly with the default value.
- The larger section on the right side of the window is the page in which you configure the item that you selected from the list.

In the list, select the item that you want to configure. Select and configure one item at a time. Follow these steps to configure items:

1. Select the first item you want to configure. The installation procedure displays the corresponding page for that item.

2. Make your configuration choices for the first item by filling in the fields on the page.
3. When you are finished configuring the first item, select another item to the left.
4. Continue selecting and configuring items until you have configured all the items that you want to install.

When you have finished configuring all the items that you want, select the **Install** button to accept the configuration choices and start the installation.

Some Interesting Trivia

You might have wondered about the appearance of the configuration panel in OS/2 Warp 4 because it seems to be the same as in IBM Warp Server. As IBM has moved the OS/2 Warp development team from Boca Raton, Florida to Austin, Texas where IBM has deployed its IBM Warp Server development people, you will encounter more and more similarities in OS/2 Warp 4.

When the configuration panel for the networking components is displayed, you will also see a small window entitled Disk Space as shown in Figure 139 on page 287, which displays the local drives on your computer, and how much space is available on each. This will assist you when deciding which drives to use for individual networking components.

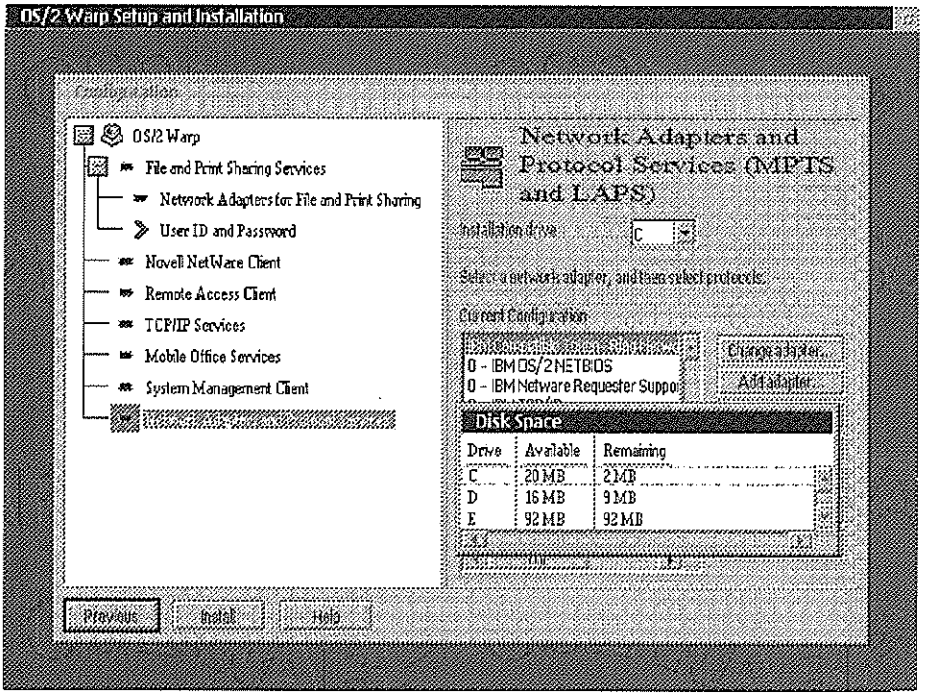


Figure 139. Advanced Installation - Disk Space

The first item you should configure is the LAN Adapter and Protocol Support (LAPS) section. Figure 140 on page 288 shows the OS/2 Warp 4 configuration menu with a possible initial configuration for LAN Adapter and Protocol Support (LAPS).

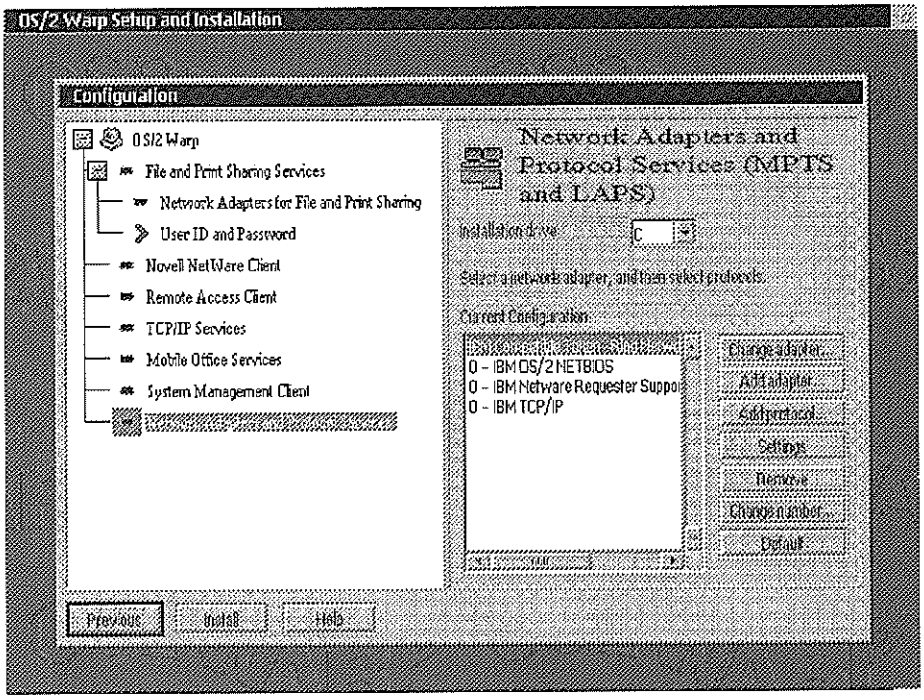


Figure 140. Advanced Installation - LAN Adapter and Protocol Support (LAPS)

As this component of OS/2 Warp 4 provides communication support to all other networking parts of the product, it will always be installed. Therefore, it cannot be explicitly selected on the OS/2 Warp 4 Setup and Installation menu, as seen in Figure 137 on page 284.

LAN Adapter and Protocol Support (LAPS) will attempt to detect and identify any network adapters that are installed in your system. See the \CID\NIFS\READMAC.TXT file on the CD-ROM for a list of adapter drivers that are supplied with OS/2 Warp 4 (this file can also be found in \IBMCOM\MACS\ once OS/2 Warp 4 is installed). However, only the first adapter that could be found will be automatically included in the configuration. You may add more adapters, and you may add additional adapter drivers that are not included in OS/2 Warp 4, which we will show later.

As far as network protocols are concerned, the initial configuration of LAN Adapter and Protocol Support (LAPS) depends on the networking components that you selected to be installed. The following list explains the conditions under which each protocol is automatically installed:

- The IBM NetBIOS protocol will be automatically configured if any of the following components are selected:

  - File and Print Client
  - Remote Access Client
  - System Management Client with NetBIOS protocol enabled
- The IBM TCP/IP protocol will be automatically configured if any of the following components are selected:
  - TCP/IP Services
  - System Management Client with TCP/IP protocol enabled
- The NetWare Requester Support driver will be automatically configured if any of the following components are selected:
  - Novell NetWare Client with NetWare File Sharing Gateway feature
  - System Management Client with IPX protocol enabled
- The IEEE 802.2 protocol will always be automatically configured.

The following table summarizes the configuration parameters of this page and describes their purposes.

Table 4 (Page 1 of 2). LAN Adapter and Protocol Support (LAPS) Installation

Configuration Item	Configuration Data
Change adapter	Click this button if you want to change a network adapter for the current configuration. This may be necessary if the installation program could not detect your adapter configuration properly.
Add adapter	Click this button if you: 1. Want to add an adapter to your configuration 2. Want to add a new adapter driver which is not supplied with LAN Adapter and Protocol Support (LAPS) This will bring up the menu that is shown in Figure 141 on page 290.
Add protocol	Click this button if you: 1. Want to add a protocol to your configuration 2. Want to add a new protocol driver which is not supplied with LAN Adapter and Protocol Support (LAPS) This will bring up the menu that is shown in Figure 142 on page 291.
Settings	Click this button if you want to change the parameters for any item in the configuration list. This will bring up a menu depending on the item you wish to change (see Figure 143 on page 292).
Remove	Click this button if you want to remove an item from the configuration list. You can remove only one item at a time. **Note:** You can remove an adapter only if you have previously removed all protocols that have been associated with that adapter.

Table 4 (Page 2 of 2). LAN Adapter and Protocol Support (LAPS) Installation

Configuration Item	Configuration Data
Change number	Click this button if you need to change the logical sequence in which a protocol driver will address adapters if this protocol has been associated with more than one adapter. Application programs will use these numbers when they issue calls to the network interface(s).

If the network adapter in your system is not supported by a driver supplied with OS/2 Warp 4, but you have an NDIS-compliant OS/2 device driver for that adapter, click on the **Add adapter** button. The following menu will be shown.

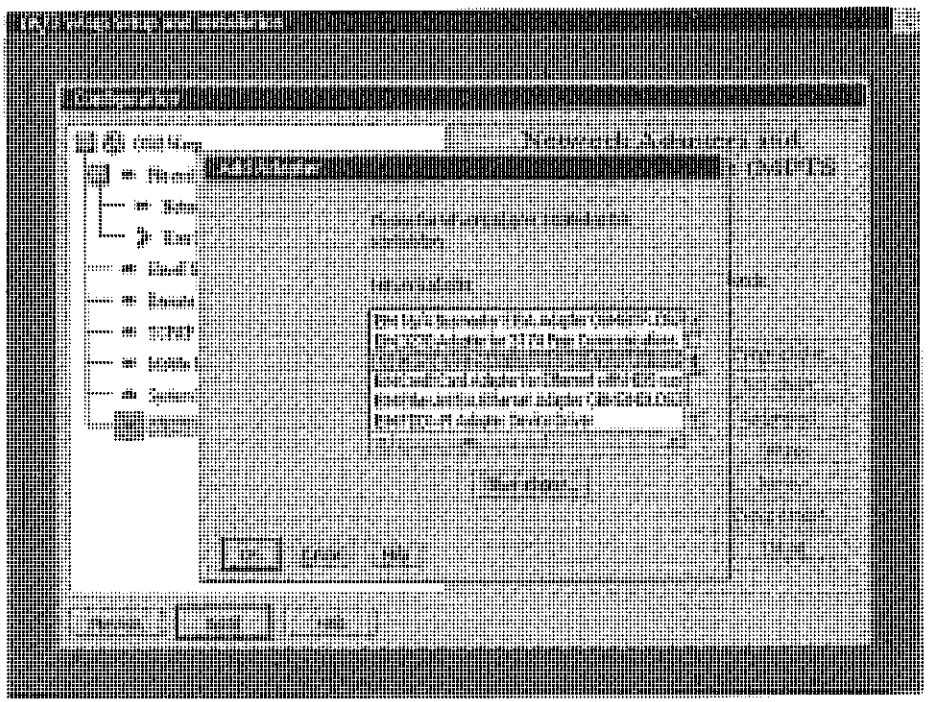


Figure 141. Advanced Installation - Add Adapter

To add an adapter to your configuration, select the appropriate driver from the list, then click on **OK**. To add a new adapter driver, select **Other adapter**, then specify the source drive from which the new driver will be copied to your system.

If you want to use a network protocol that is not supplied with OS/2 Warp 4, but you have an NDIS-compliant OS/2 protocol driver for that protocol, click on the **Add protocol** button. The following menu will be shown:

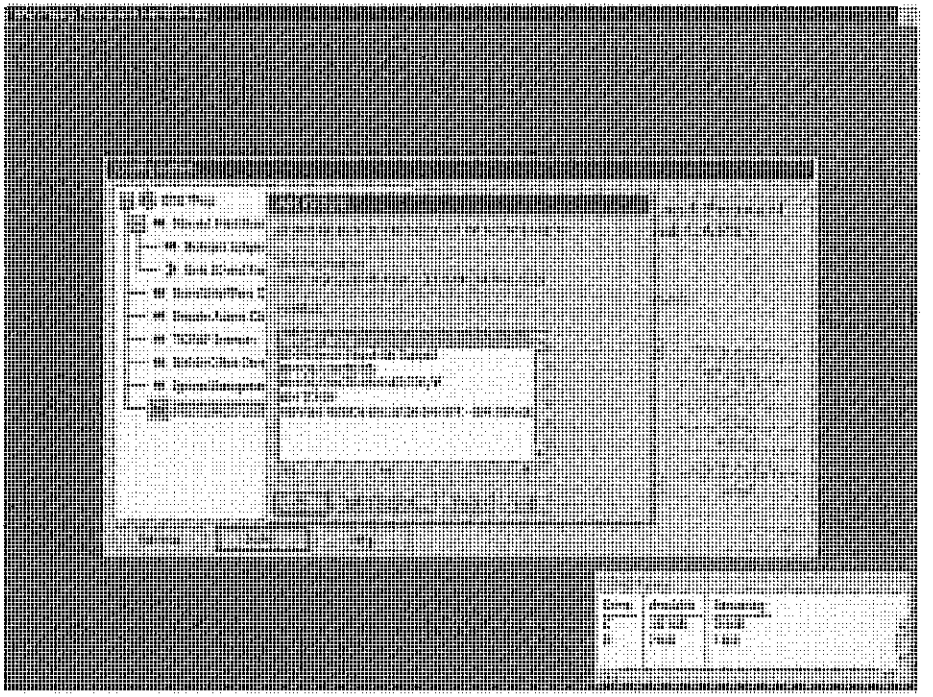


Figure 142. Advanced Installation - Add Protocol Driver

To add a protocol to your configuration, select the appropriate driver from the list, then click on **OK**. To add a new protocol driver, select **Other protocol**, then specify the source drive from which the new driver will be copied to your system.

Adding an adapter or protocol may affect the configuration of other OS/2 Warp 4 components, so you may want to check the items on the configuration tree again. For instance, adding the NetBIOS over TCP/IP protocol will result in another LAN adapter that can be selected for the File and Print Client.

If you want to view or change the configuration of any adapter or protocol driver, select the appropriate item on the list, then click on the **Settings** button. You must do this, since the factory defaults settings on the LAN adapter have been altered.

The following menu will be shown if you selected to change the settings for the network adapter.

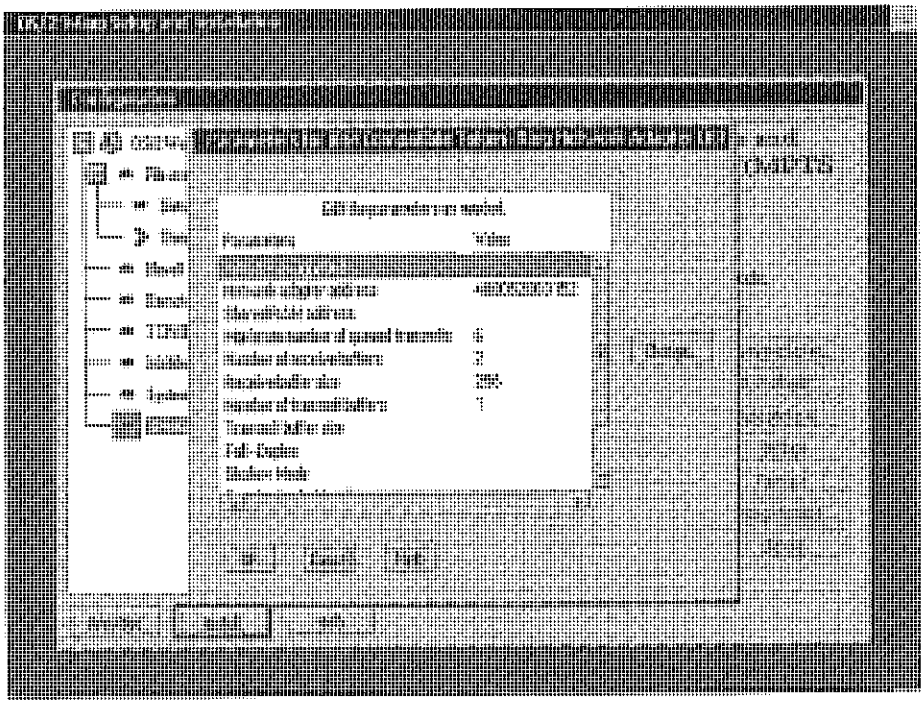


Figure 143. Advanced Installation - Parameters for Network Adapter

What If You Do Not Have a Network Adapter?

If you are installing networking components for remote access *only*, select the **No Network Adapter** entry in the list.

Next, you should configure the File and Print Client, assuming you have chosen to install this component, using the window shown in Figure 144 on page 293.

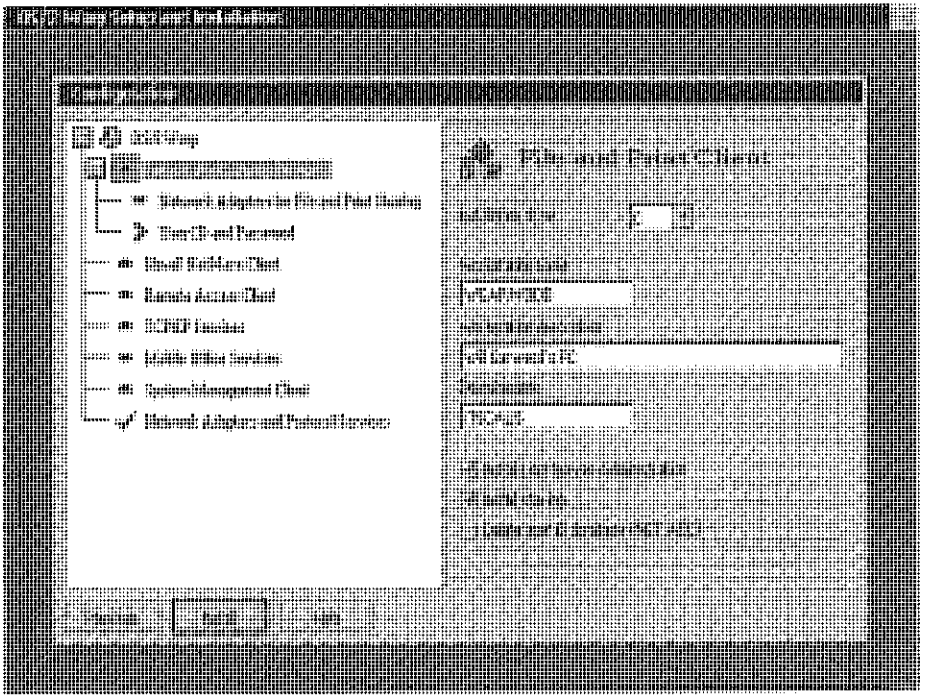


Figure 144. Advanced Installation - File and Print Client

Use this window to make choices about installing the File and Print Client itself. You will need to complete the following fields:

- **Installation drive**

  This is the drive on which you wish to install the File and Print Client.

- **Workstation name**

  This is the name by which your computer will be known on the LAN. The name must be unique across the LAN.

- **Workstation description**

  This is an optional description that identifies your workstation to other users on the LAN.

- **Domain name**

  This is the name of the peer workgroup or IBM LAN Server/IBM Warp Server domain to which your computer will, by default, belong (see 5.5, "Peer Networking" on page 382 and 5.3, "Accessing IBM Warp Server and Microsoft Windows NT Server" on page 342 for more details on domains).

- **Install LAN Server Administration**

  Selecting this check box installs the full graphical user interface (GUI) for IBM LAN Server or IBM Warp Server administration utilities.

- **Install sharing**

  Selecting this check box installs software that allows you to use resources on other peer workstations and also share the resources of your own computer on the network.

- **Delete user ID database (NET.ACC)**

  Select this option if you are reinstalling over a previous version of File and Print Client and you want to start with a clean Domain Control Database (DCDB). The DCDB contains information about users, groups of users, and resources.

  Do not select this option if you are migrating from a previous version of File and Print Sharing Services and you want to keep this information.

If you have more than one network adapter installed and configured in your computer, you can activate one or more adapters for use with the File and Print Client, using the window shown in Figure 145.

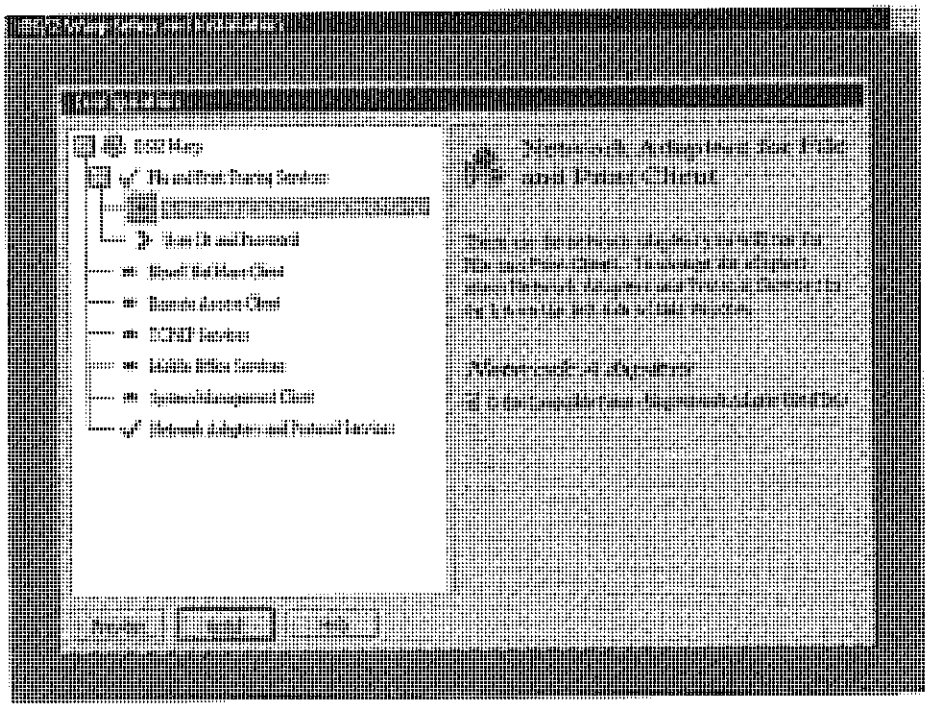


Figure 145. Advanced Installation - Network Adapters for File and Print Client

Select the network adapters on your computer that will be used by the File and Print Client. If you want to change or add additional adapters, select LAN Adapter and Protocol Support (LAPS) from the list on the left side of this window.

You should now select a default user ID and password for network logon, as shown in Figure 146.

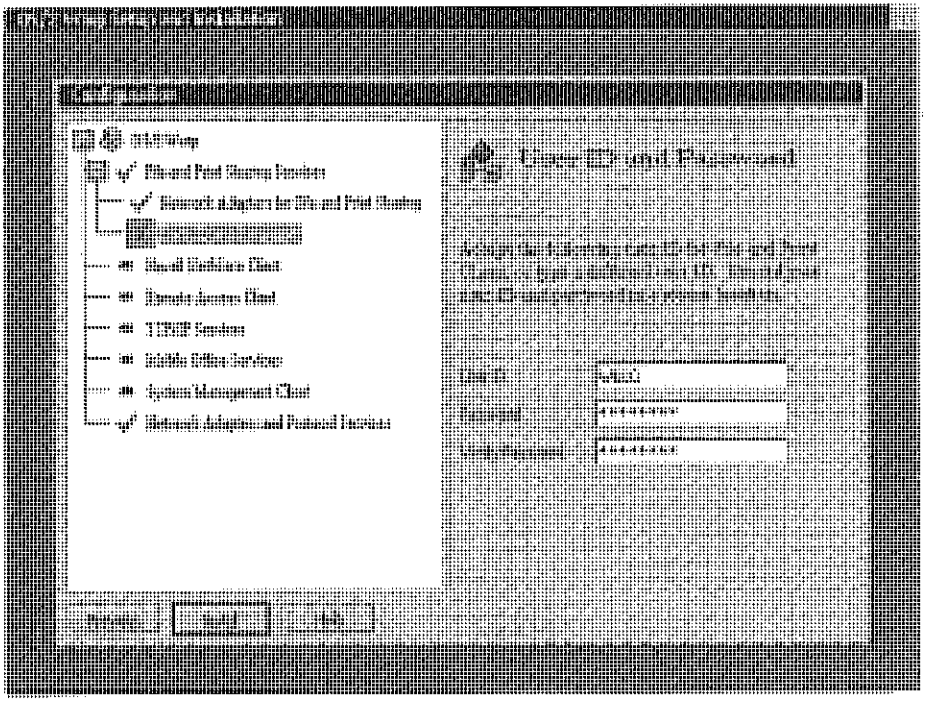


Figure 146. Advanced Installation - User ID and Password

Use this window to specify a user ID and password that you will use to log on. The letters are displayed when you type your user ID. To help keep your password secure, asterisks (*) are displayed when you type your password in the Password and Verify password fields. Your password should contain 4-15 characters. Your user ID should contain 1-20 characters and be unique on the network. It must not be the same as the name used for the workstation. Note that this user ID is mandatory.

Next, you must configure the installation of the Novell NetWare Client, using the window shown in Figure 147 on page 296.

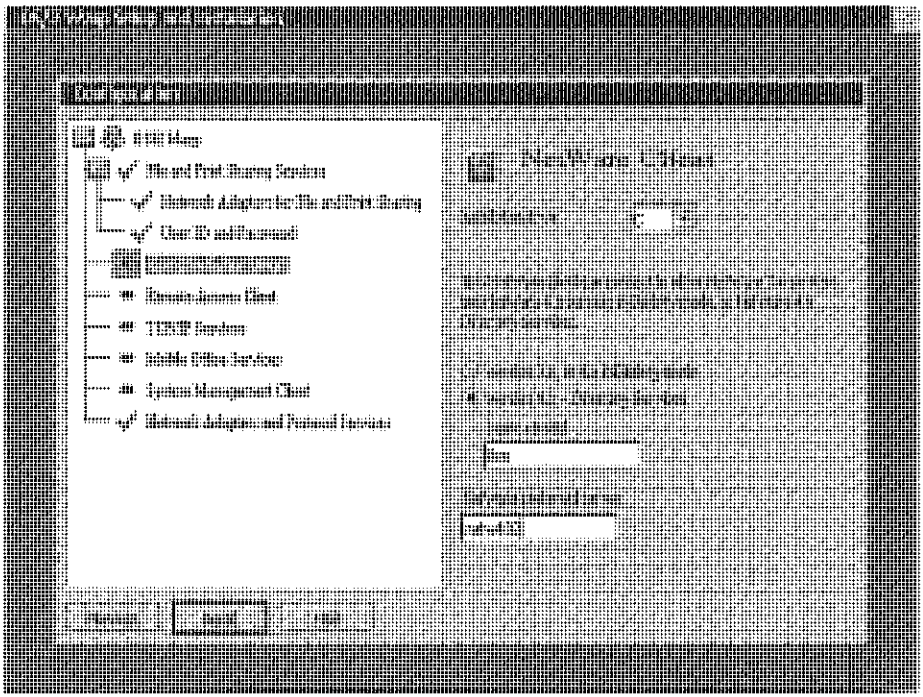


Figure 147. Advanced Installation - Novell NetWare Client

Use this window to make choices about installing the Novell NetWare Client. You must complete the following fields:

- **Installation drive**

  This is the drive on which you wish to install the Novell NetWare Client.

- **Novell Server Mode**

  Choose whether you want to log in to the NetWare server using bindery mode or NetWare Directory Services.

- **Name Context**

  Enter the name context for your NetWare 4.x Directory Services location. This field is not selectable if you choose to log in using bindery mode.

- **NetWare Preferred Server**

  Enter the name of a specific NetWare server to which you want to connect. If you do not specify a server in this field, the software will randomly connect you to a server.

For more detailed information on NetWare 4.x Directory Services name context and NetWare preferred servers, see 5.4, "Accessing Novell NetWare Servers" on page 355.

You must next configure the Remote Access Client, using the window shown in Figure 148.

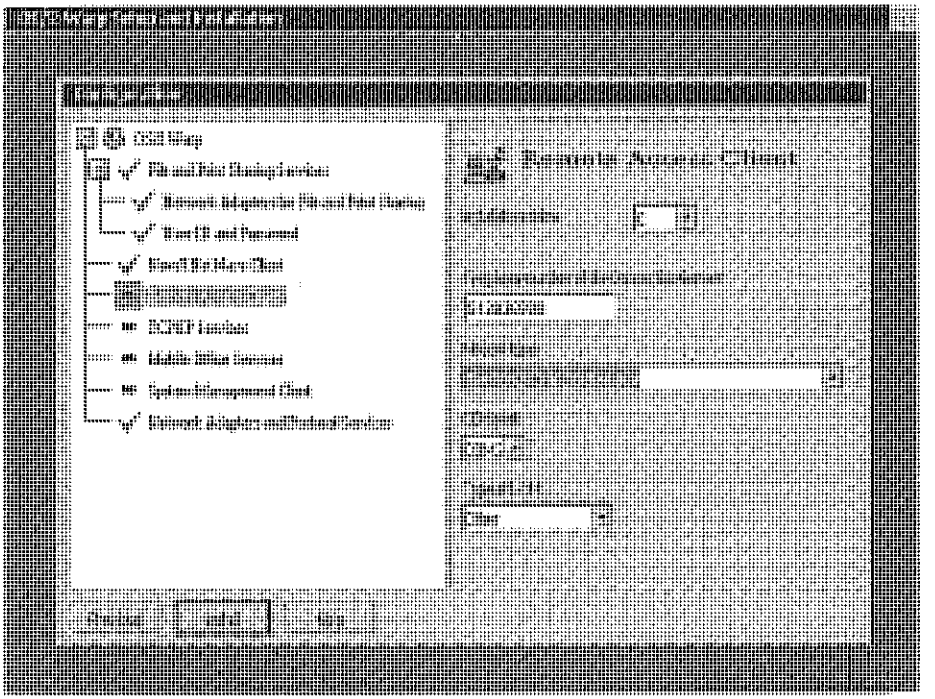


Figure 148. Advanced Installation - Remote Access Client

Use this window to select the COM port and modem you will use to access the LAN over telephone lines and to specify the telephone number for the server that connects to the LAN.

You must now configure TCP/IP Services, using the window shown in Figure 149 on page 298.

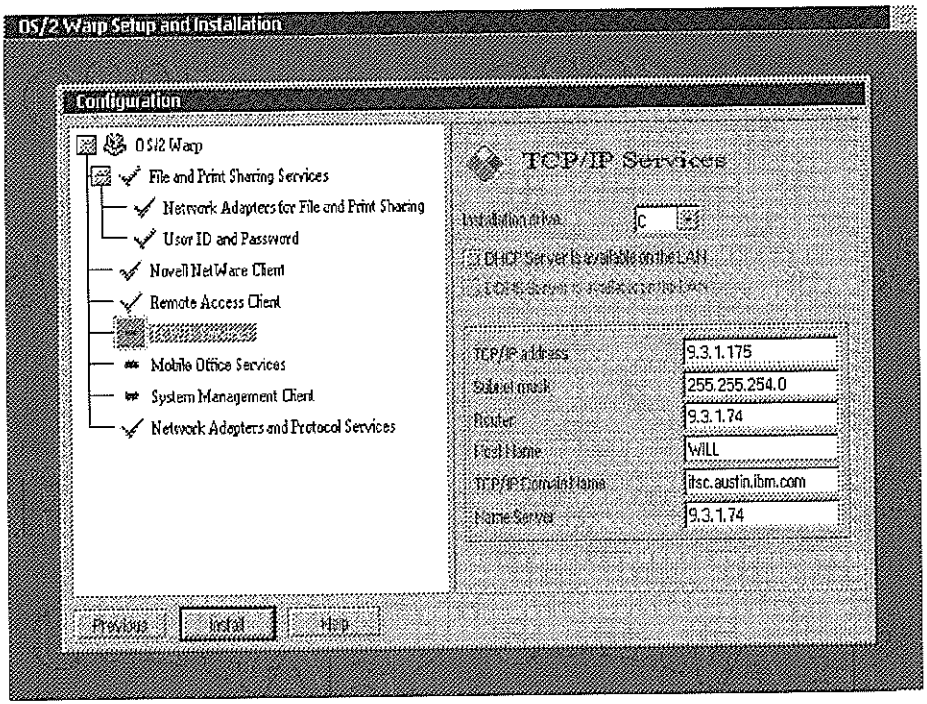


Figure 149. Advanced Installation - TCP/IP Services

Use this window to specify information about the TCP/IP configuration you will install on your workstation. This TCP/IP configuration information is optional at this time, but you *must* configure TCP/IP before you can use it on a LAN. If you want to use TCP/IP only to access the Internet through a modem, leave this configuration information blank. See your TCP/IP or network administrator for information about configuring TCP/IP.

Select the hard disk drive on which you want to install TCP/IP Services using the Installation drive field.

If your network provides a DHCP Server or an DDNS Server (or both), select the appropriate check boxes.

- Dynamic Host Configuration Protocol (DHCP) provides a framework for passing configuration information to hosts on a TCP/IP network. The DHCP server supports automatic, dynamic, and manual allocation of Internet Protocol (IP) addresses. If you are using DHCP, you do not need to configure an IP address for your OS/2 Warp 4 system.
- Dynamic Domain Name Services (DDNS) automatically registers the TCP/IP host names and IP address mappings of the workstations attached to the LAN.

Select **DHCP Server is available on the LAN** if the workstation on which you are installing TCP/IP Services will use a DHCP server that is installed elsewhere on the LAN. Select **DDNS Server is available on the LAN** if the workstation on which you are installing TCP/IP Services will use a DDNS server that is installed elsewhere on the LAN.

If neither a DHCP or DDNS server is available on your network, you must specify the following information:

- **TCP/IP address**

  This is your system's IP address. An IP address has four numbers separated by decimal points. Each number can have 1 to 3 digits (for example, 127.40.99.100).

- **Subnet mask**

  This is the subnet mask used for your network, and is provided by your network administrator (for example, 255.255.255.0).

- **Router**

  This is the IP address of your network router (for example, 129.35.96.1).

- **Host Name**

  This is your system's host name on the TCP/IP network (for example, "myhost").

- **TCP/IP Domain Name**

  This field is optional, and defines the name of the TCP/IP domain in which your system operates (for example, "mydomain.uc.edu").

- **Name Server**

  This is the IP address of your network's domain name server (for example, 9.3.199.2).

You must now configure Mobile Office Services. This is a very simple process since you have only one choice to make, as shown in Figure 150 on page 300.

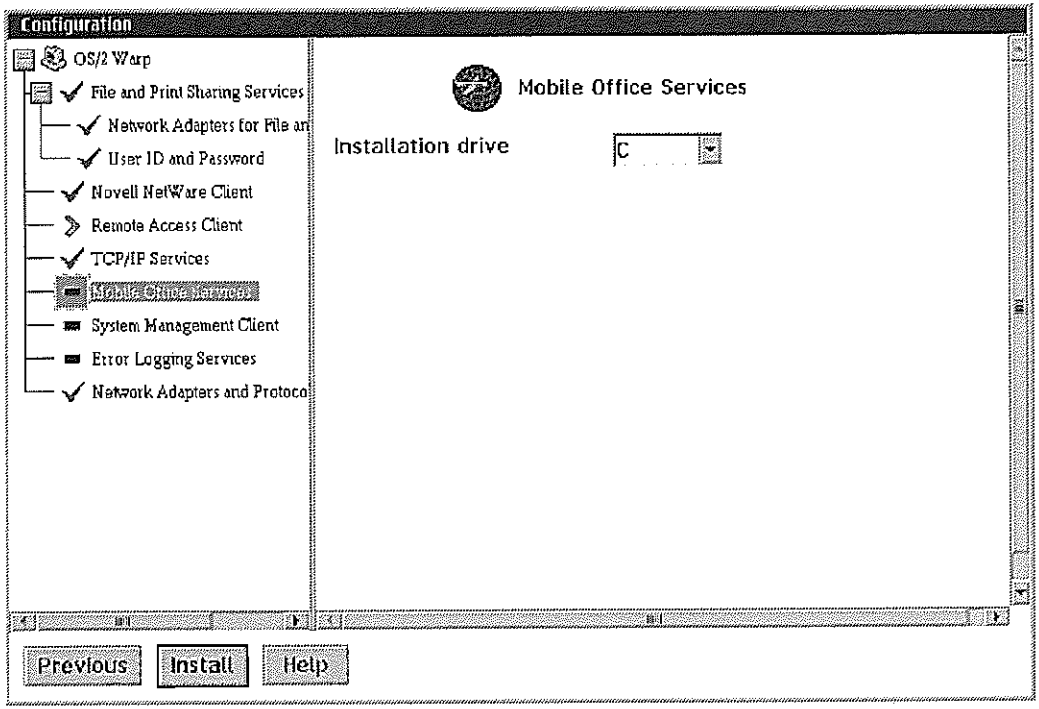


Figure 150. Advanced Installation - Mobile Office Services

Specify the drive on which you want to install Mobile Office Services.

Next, you must configure the System Management Client, as shown in Figure 151 on page 301.

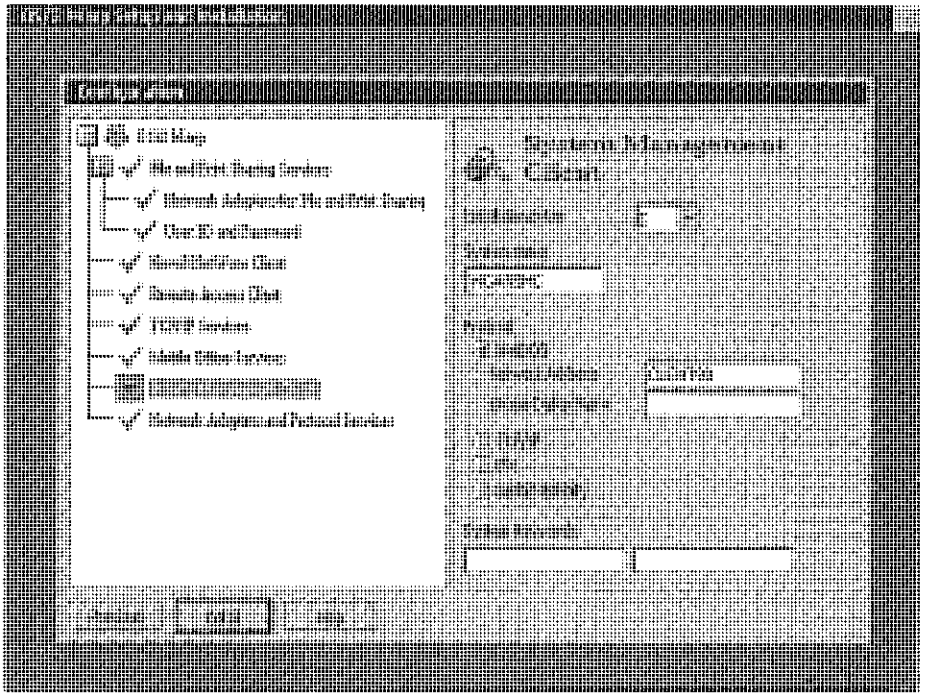


Figure 151. Advanced Installation - System Management Client

You must complete the following information for the System Management Client. It should be noted that these specifications should be configured by the network administrator. If you are not the network administrator, you should consult with him/her on which specifications to enter here:

- Select a drive on which to install the System Management Client.
- The System name field defaults to the workstation name. This identifies the workstation to the System Management Server and must be unique.
- Select one or more protocols. The System Management Client uses LAN Adapter and Protocol Support (LAPS) which is part of the Multiple Protocol Transport Services. The protocols that you select here will automatically install the applicable protocol in LAPS if it has not been installed already. The protocol must be the same as the one used by the System Management Server in order for the client and the server to talk to one another - again, if you are not the network administrator, check with him/her on what protocol to use.
  - **NetBIOS**

    Uses the same protocol as the File and Print Client - it selects the IBM OS/2 NetBIOS protocol in LAPS. If you select the NetBIOS protocol, specify:

- The network address of the workstation on which you are installing the System Management Client. This must be unique on the network and is a means of identifying your machine. The network address defaults to the first 6 characters of the workstation name plus 2 randomly generated digits such as 01. You can accept the default or specify another network address. The maximum number of characters for the network address is 8.
- The unique dial-up address is, as the name suggests, unique on the network and is a way of identifying your machine if the network administrator accesses your workstation's System Management Client remotely via modem using NetBIOS.

– **TCP/IP**

  Uses the TCP/IP protocol, which is the same protocol used to access Internet services. It selects the IBM TCP/IP protocol in LAPS.

– **IPX**

  Uses the Internet Package Exchange protocol to connect to Novell servers, or any workstation or router that implements IPX with other workstations. Although similar to the Internet Protocol (IP), IPX uses different packet formats and terminology. It selects the IBM NetWare Requester Support protocol in LAPS.

– **Serial NetFinity**

  Uses a telephone line and a modem to communicate with a Systems Management server.

- Optionally, you can enter the workgroup name in the System Keywords field. These keywords are for the benefit of the network administrator and are values that can sort the workstations into groups. For example, to sort systems by protocol, a NetBIOS group and a TCP/IP group could be created: NetBIOS and TCP/IP could be used as system keywords to find the group of systems that share a common protocol.

After you have provided all the information as described above, you can start the installation process by clicking on the **Install** button. At this point, OS/2 Warp 4 installs the second part of the base operating system and the network components you have selected.

Installing NO Networking Components

If you selected none of the networking components within the Advanced installation, OS/2 Warp 4 will only set up LAN Adapter and Protocol Support (LAPS).

5.1.4 Installing Remotely on the LAN

You can install OS/2 Warp 4 remotely over a LAN, as described in Chapter 2, "Planning and Installing OS/2 Warp 4" on page 15. This remote installation allows you to install networking components as well as the OS/2 Warp 4 operating system. Installing remotely is exactly the same as installing locally from a CD-ROM, and you will be presented with the same configuration choices.

If you decide to perform a remote installation to a target computer that already has OS/2 Warp 4 installed, you will see a message as shown in Figure 152.

```
OS/2 Warp is already installed on your workstation.

Do you want to reinstall OS/2 Warp with
networking support, or install only networking
support?

Install networking only
Reinstall OS/2 Warp with networking

Enter  F1=Help
```

Figure 152. Remote Installation - Message

This message informs you that OS/2 Warp 4 is already installed on this computer, and allows you to choose either of two options:

- You can install the networking components only. This is exactly the same as performing a local installation using the Selective Install for Networking utility, as described in 5.1.5, "Installing Individual Networking Components" on page 304.
- You can perform a complete reinstallation of OS/2 Warp 4, including both the operating system and the networking components.

After you choose your desired option from the menu, press the Enter key to continue the installation.

5.1.5 Installing Individual Networking Components

You can add networking components to your OS/2 Warp 4 system after you have installed OS/2 Warp 4 by simply using the Selective Install for Networking utility. This utility resides in the OS/2 Warp 4 Install/Remove folder within the OS/2 System folder on your desktop, and is the same utility you have already used while installing OS/2 Warp 4 on your computer.

5.1.6 Using the Selective Install for Networking Utility

Start the Selective Install for Networking utility by double-clicking your mouse on its icon in the OS/2 Warp 4 Install/Remove folder.

You will now be asked to choose the **Easy** or **Custom** installation options, as shown in Figure 153.

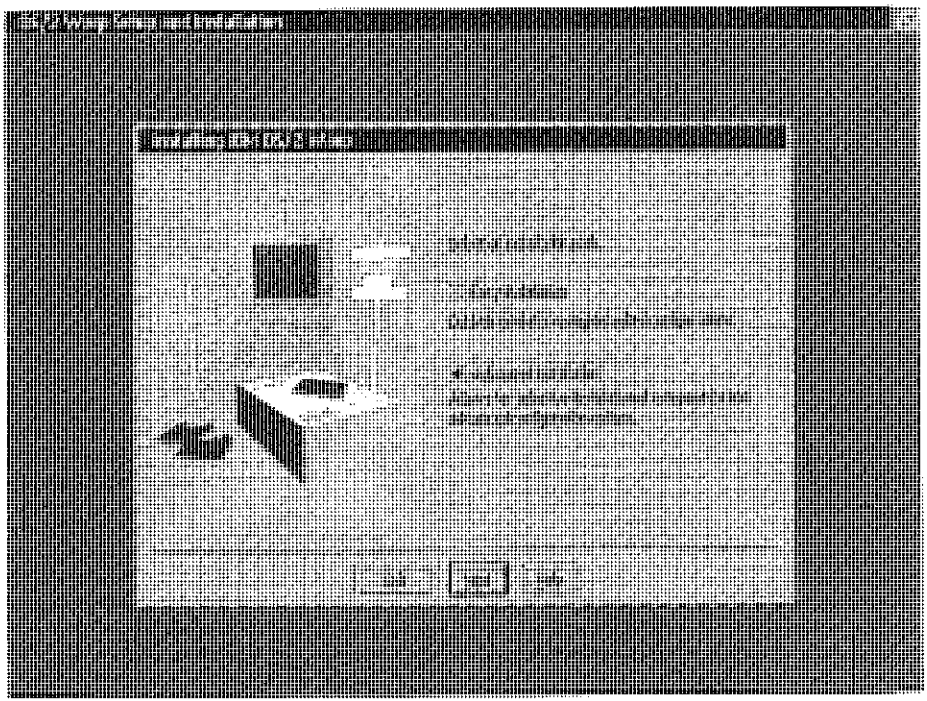


Figure 153. Selective Install for Networking - Easy or Custom Installation

When you have chosen the option you require, select the **Next** button to continue.

From this point on, the installation proceeds exactly as it would if you were installing networking components during OS/2 Warp 4 installation. See 5.1.2, "Easy Installation"

on page 264 or 5.1.3, "Advanced Installation" on page 283, depending on which installation option you select.

5.1.7 Automating the Installation Process

If you are installing OS/2 Warp 4 and its networking components on multiple computers, you can automate the process and avoid the need to answer all the installation questions for each computer. You can provide all the configuration and installation options in a response file, as described in 2.9, "Configuration, Installation, and Distribution (CID)" on page 74, and replicate the standard configuration to multiple computers.

Note that information such as network addresses and NetBIOS names must be unique on a network, so you may need to create a separate response file for each computer on which you will install OS/2 Warp 4.

5.1.8 Using Individual Product Installation Diskettes

You can also create diskettes for the individual networking products if you want to install them from diskette. You can create diskettes for the following networking products:

- Remote Access Client, known as LAN Distance Requester
- Mobile Office Services, known as Mobile File Sync
- Multiple Protocol Transport Services
- Novell NetWare Client, known as NetWare Client for OS/2
- Network SignON Coordinator
- System Management Client, known as System View Common Agent and TME10 NetFinity
- TCP/IP for OS/2
- File and Print Client, known as IBM PEER for OS/2

To start the OS/2 Warp 4.0 Diskette Utility that creates the diskettes, type `PRODDSKS` in the root directory of the OS/2 Warp 4 CD-ROM. This utility will also create OS/2 Warp 4 (operating system only) diskettes.

5.2 Local Area Network (LAN)

If you are connected to a local area network (LAN), you may want to share some of the resources on your OS/2 Warp 4 system, such as files, directories, printers and applications, with other users on the LAN. Even more likely is that you will want to access resources on other users' systems, or on servers attached to the LAN. Resources that are shared on the network in this way are known as *network resources.* We will use this term throughout this book to refer to any file, directory, printer or other device that is shared on the LAN.

OS/2 Warp 4 includes a number of networking components, which give you access to a wide variety of network resources. These components are:

- File and Print Client
- Novell NetWare Client
- TCP/IP Services

The networking components appear and behave in a very similar way, and in fact they share many common characteristics:

- They allow you to browse the network resources available to you, using the Connections folder on your Workplace Shell desktop.
- They allow you to exchange information with other users on the network using OS/2 Warp 4's Network DDE and Clipboard facility.
- They allow you to coordinate multiple LAN passwords using the Network SignON Coordinator facility, allowing you to have a single-signon capability to access multiple LAN environments.
- They provide a Network Messaging facility.
- They allow you to audit other users' access to resources that you share on the network.
- They all connect to the network using a common OS/2 Warp 4 component named LAN Adapter and Protocol Support (LAPS).

Most of these capabilities are seamlessly integrated into the Workplace Shell, so you can use network resources in the same way as you use any other resources, such as programs, files and directories on your Workplace Shell desktop. This means that accessing and using network resources is simply a matter of dragging and dropping Workplace Shell objects.

This chapter describes how to access network resources and use the common facilities provided by OS/2 Warp 4. Some network tasks, however, are unique to a particular type of network environment, such as IBM Warp Server or Novell NetWare. These tasks are described in the chapters that deal with those network environments. Where necessary, this chapter will direct you to particular sections within those chapters.

Note that LAN Adapter and Protocol Support (LAPS) is not discussed in this chapter. See 5.6, "Mobile Office" on page 412 for details.

5.2.1 Accessing Your Network Connections

After OS/2 Warp 4 installation, the Connections folder will appear on your Workplace Shell desktop. This folder contains the objects that allow you to connect to the network and access network resources, as well as certain other objects that relate to devices attached to your computer. A sample Connections folder is shown in Figure 154 on page 307.

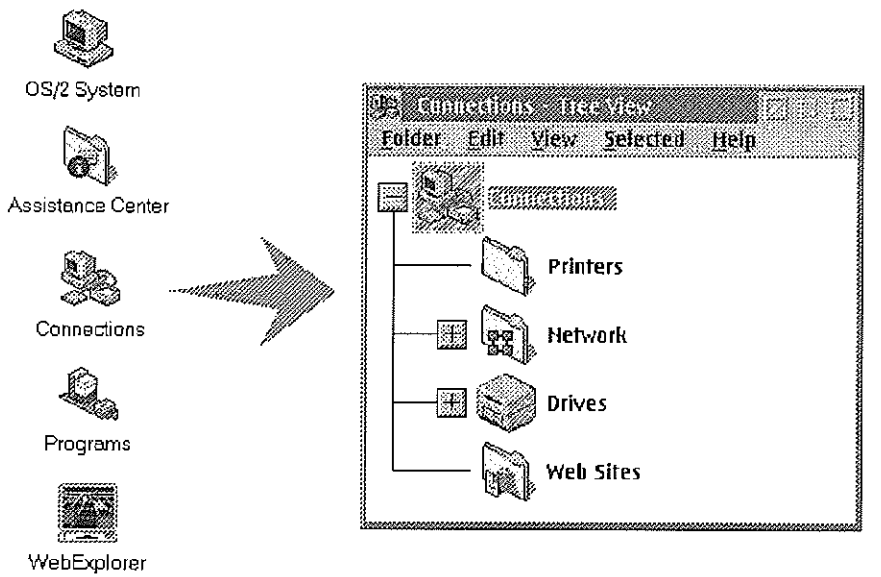


Figure 154. The Connections Folder

The Connections folder provides a focal point from which you can perform many of the tasks related to your hard disk, diskettes and printers. If you have installed any networking components, additional objects will appear in the Connections folder. For example, you will have a Web Sites folder if you install Internet access, and a Network folder if you install the File and Print Client, Remote Access Client, Novell NetWare Client or Mobile Office Services.

The Network folder contains many of the tools and facilities that you will use to locate, access and manipulate network resources. This folder and its contents are described in detail in 5.2.3, "Using the Network Folder" on page 313.

Your Connections folder may contain a number of folders that are not related to local area network connections, such as the Web Sites folder.

5.2.1.1 Network Drives

The Drives object in your Connections folder shows all the logical drives available on your OS/2 Warp 4 system. After you have logged on to a local area network, whether it is an IBM Warp Server, Novell NetWare Server or any kind of peer network, the Drives object will display additional drives to which you have been given access by the owners of those resources. These drives actually reside on servers or other users' machines on a peer network, and your network administrator or the owner of that resource must grant you access to the resource before it will appear in your Drives object.

Logical drives that are accessed over the network are known, not surprisingly, as *network drives*. The Workplace Shell distinguishes network drives from drives that reside on your own computer, which are known as *local drives*, by using a different icon for network drives. This icon allows you to easily see which drives reside on your own computer, and which drives are accessed over the network.

You can work with network drives in the same way that you work with local drives, creating and working with objects in the same way as you would with objects on your own system. However, there are certain operations that you cannot perform on a network drive, such as running a Check Disk command or formatting the drive.

It is worth remembering that any changes you make to the appearance of a network drive, or of any object on a network drive, will affect all the users that access that resource. For example, if you change the default view of a folder within a network drive, or alter the default sort order, the new defaults will affect all other users. If you like the Details View of a folder and decide to change all your network drives to show this view as the default, you would be wise to ensure that all your colleagues agree with you!

5.2.1.2 Administering Network Drives

If you installed the Sharing option when you installed the File and Print Client on your OS/2 Warp 4 system, you will be able to share your own resources on a peer network, and you can control how these resources are shared. Similarly, if you installed the Administration option and you are defined on an IBM Warp Server network as an administrator, you will have the authority to administer network resources.

If you are able to administer resources, the context menu for each drive within your Drives object will display additional items that allow you to perform administration functions on those drives, as shown in Figure 155 on page 309.

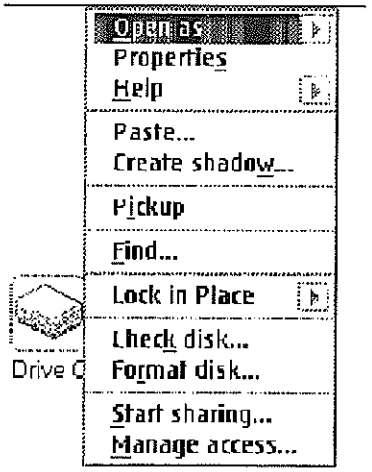


Figure 155. Drive Object - Additional Context Administration

Any folders within each drive will also display these extra items on their context menus, so that you can share and administer each folder as a separate network resource if you wish. Note, however, that these items will not appear, even on the context menus of your local drives, until you have logged on, since only after logon can OS/2 Warp 4 tell that you have the authority to perform administration tasks.

We will take a closer look at administering your resources on a peer network in 5.5, "Peer Networking" on page 382, but this book will not cover the topic of administering a LAN Server or IBM Warp Server network.

5.2.1.3 Checking Detailed Drive Information

Like all Workplace Shell objects, each drive within the Drives object has a Properties notebook. For network drives, this notebook contains an additional Details tab, as shown in Figure 156 on page 310.

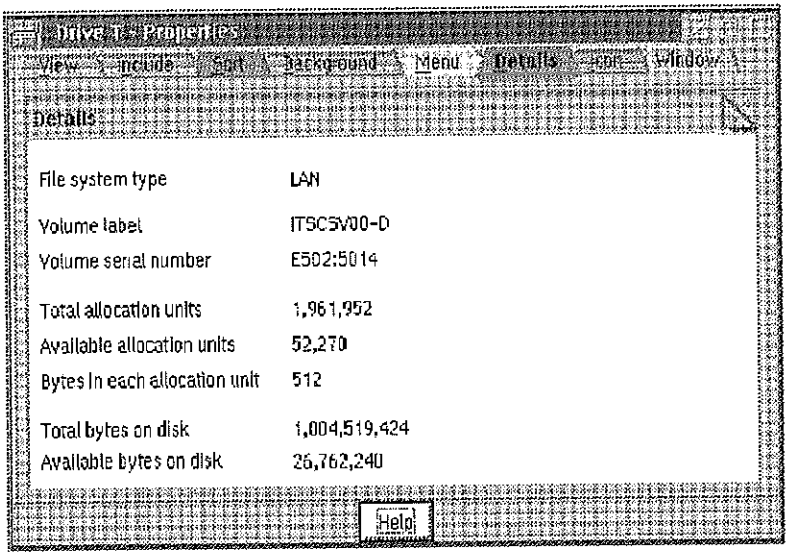


Figure 156. Network Drive Object - Details

This tab gives you information about the system on which the drive resides, the size of the drive, the amount of free space and so on.

5.2.2 Network Printers

The Printers folder within the Connections folder contains objects for each printer attached to your system. In this folder, you will find the default printer object you created during OS/2 Warp 4 installation, plus any other printer objects you might have installed later.

5.2.2.1 Creating a Network Printer Object

A template called Network Printer is placed in your Printers folder when you install the File and Print Client or Novell NetWare Client on your OS/2 Warp 4 system. This template allows you to manually create a new printer object that connects you to a network printer. The procedure to do this is as follows (make sure you are logged onto the network):

1. Click on **Connections=>Printers=>Network Printer** and press the right mouse button.
2. Holding down the right mouse button, drag and drop a copy of the Network Printer into the Printers folder or anywhere on the desktop.

3. The Access another network printer dialog box will appear on the panel. This has three fields: Network, Server and Resource. Notice that all have a down arrow on them - this allows you to view other selections if they are available.
4. In the Network field, select the network printer you want to access is on.
5. In the Server field, select the print server that the printer is on.
6. In the Resource field, select the printer name that you want to access.
7. If the driver that the network printer requires is already installed on the workstation, you have finished the installation of the network printer. If the driver is not present, you will be asked for the OS/2 Warp 4 CD-ROM or a driver diskette. Once you have completed this, you have installed the network printer.
8. The name of the printer is the same as the Resource name.

However, the best way to install a network printer object is to use one of the *resource browsers* as described in 5.2.8.2, "Shadowing Network Objects on Your Desktop" on page 326.

One thing to remember is that you must always have the correct printer driver installed on your OS/2 Warp 4 system, even if the printer is attached to a server on your network. This is because network printing under OS/2 Warp 4 requires a driver in your system as well as the server. After you have installed the printer driver on your system, you can keep this driver up-to-date automatically by retrieving new versions from the server. This is described in 4.2.4, "Obtaining New and Updated Printer Drivers" on page 235.

5.2.2.2 Controlling Network Printers

A network printer object has a Properties notebook, just like any other object. However, this notebook includes two additional tabs that are not present in the Properties notebooks for local printers.

The Network Status tab provides information about the network printer and the server on which it resides. This tab is shown in Figure 157 on page 312.

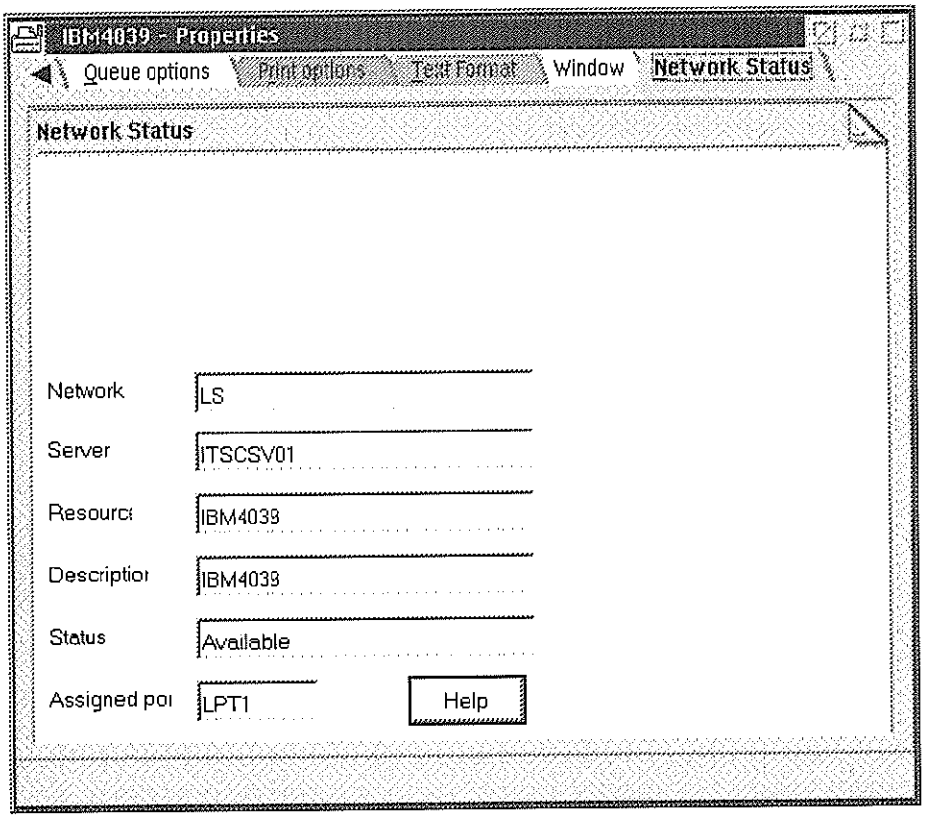


Figure 157. Network Printer Properties - Network Status

Note that you cannot modify any of the information on the Network Status tab. Other tabs, such as the Output Port tab, allow you to make changes to the configuration of a network printer.

The Advanced Options page allows you to automatically update the printer configuration and job properties from the server, as shown in Figure 158 on page 313.

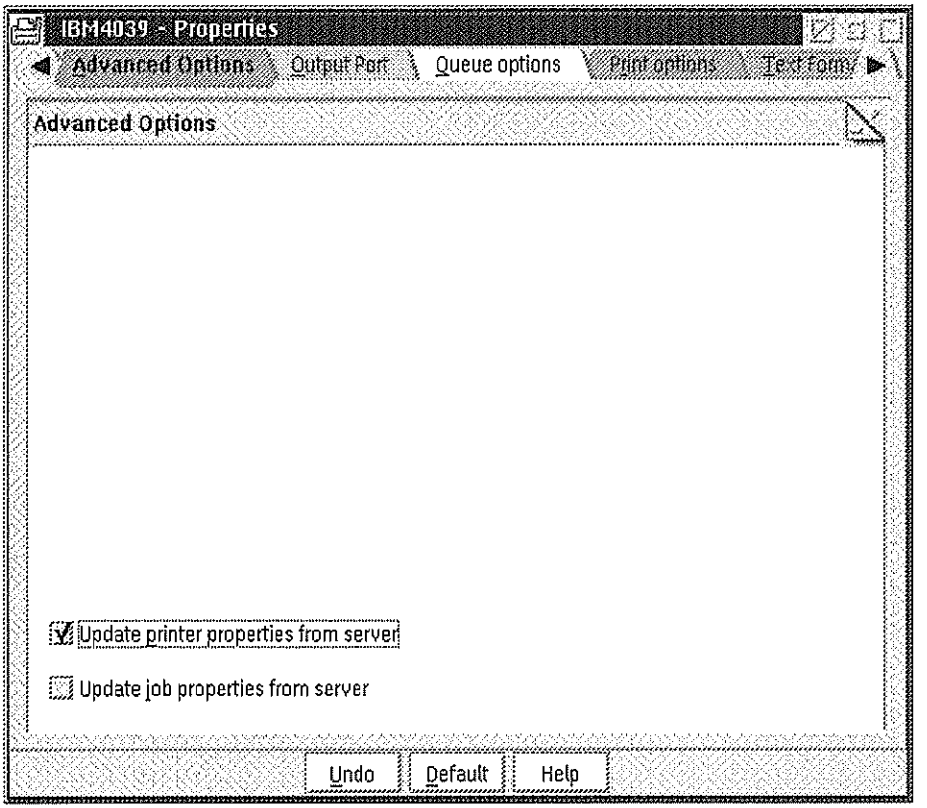


Figure 158. Network Printer Properties - Advanced Options

If you use these options, a network administrator can provide you with several different printer objects, each with a different configuration, thereby allowing you to generate different predefined print formats on your network printers. For example, you might have one printer object that automatically generates output with a "portrait " page orientation, and another printer object that generates output with a "landscape" orientation. These two objects can actually represent the same printer, but with different job properties.

For more information concerning printer objects, see Chapter 4, "Printing" on page 229.

5.2.3 Using the Network Folder

The Network folder appears in your Connections folder when you install any of the local area networking components of OS/2 Warp 4, such as the File and Print Client or the Novell NetWare Client. The tools and utilities within the Network folder allow you to:

- Log on to or log off from multiple networks including:
  - IBM Warp Server and IBM LAN Server

  - Peer Services
  - Novell NetWare Server

  You can access any or all of these networks concurrently
- Browse all the network resources available to you
- Access files, directories and printers using drag and drop techniques with the Workplace Shell
- Assign logical drive letters and ports to network resources, so that you can access them from applications that require a drive letter or port name

The Network folder contains a number of objects, depending on the networking components you have chosen to install.

The Network Services folder contains a number of utilities that allow to you to configure, start, log on to and log off from different networking components. This folder is always present when you have installed any OS/2 Warp 4 networking components, and its contents are discussed in various chapters throughout this book, which deal with configuring and using particular networking components.

The Network Applications folder appears when you log on to an IBM Warp Server domain, and an administrator has granted you access to shared applications on that domain. For an explanation of domains and network applications, see 5.3, "Accessing IBM Warp Server and Microsoft Windows NT Server" on page 342. Note that whenever you log off from an IBM Warp Server or IBM LAN Server domain, the Network Applications folder will disappear.

If you have installed the File and Print Client or the Novell NetWare Client, your Network folder will contain one or more resource browsers. The File and Print Client Resource Browser allows you to see all the network resources available to you on IBM LAN Server, IBM Warp Server or Microsoft Windows NT Server systems, and on peer workstations on your LAN. The Novell NetWare Resource Browser allows you to see the resources available on Novell NetWare servers on your LAN.

5.2.3.1 Starting Your Network Clients

When you install networking components such as the File and Print Client and the Novell NetWare Client, OS/2 Warp 4 starts the client software automatically when you boot your OS/2 Warp 4 system. This is always true for the Novell NetWare Client, which is started by statements in your OS/2 Warp 4 CONFIG.SYS file.

For the File and Print Client, however, you may disable automatic startup of the client software. If you want to start the client software manually, you can click on the **Start File and Print Client** object in the Logons folder. Alternatively, if you attempt to log on to the network using the File and Print Client without first starting the client, OS/2 Warp 4 will automatically start the client for you.

5.2.3.2 Logging On

Inside the Network Services folder, you will find a Logons folder similar to that shown in Figure 159.

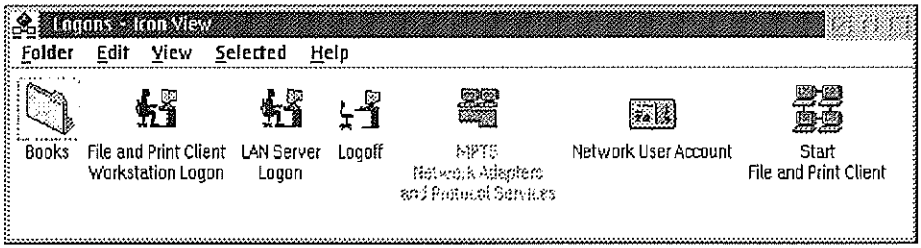


Figure 159. Logons Folder

This folder contains objects that allow you to log on to and log off from a peer network or an IBM LAN Server/IBM Warp Server domain. There are also objects that allow you to manage your network user account and configure your network transport protocols, and a folder containing online documentation about OS/2 Warp 4's networking components.

Note

If you use your OS/2 Warp 4 system on a peer network as well as logging on to an IBM Warp Server or IBM LAN Server domain, try to use the same user ID and password for your own system on the peer network as you use on the server. If you do this, you need to log on only once to access peer resources and server resources.

Your Logons folder contains two icons to log on to the network:

- File and Print Client Workstation Logon allows you to log on to a peer network. Verification of your user ID and password is performed in your own OS/2 Warp 4 system.
- **LAN Server Logon** allows you to log on to an IBM LAN Server or IBM Warp Server domain. Verification of your user ID and password is performed at the server.

Note that if you log on to a domain using IBM LAN Server Logon, and you have the same user ID and password defined on your own system for use on a peer network, you will automatically be logged on to the peer network at the same time. If you try to browse network resources using either of the resource browsers in the Network folder, without first logging on to the network, OS/2 Warp 4 will automatically display a dialog prompting you to log on.

5.2.3.3 Logging on to a Peer Network

To log on to a peer network, double-click your left mouse button on the **File and Print Client Workstation Logon** object. OS/2 Warp 4 will display a dialog like that shown in Figure 160.

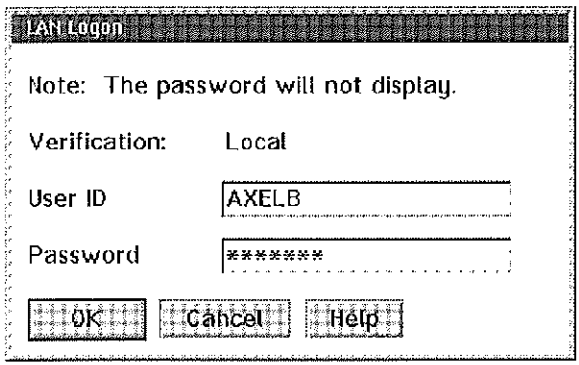


Figure 160. Logon for a Peer Network

Enter your user ID and password, then click on the **OK** button to complete the logon.

5.2.3.4 Logging on to a Server Domain

To log on to a IBM LAN Server, IBM Warp Server, Microsoft LAN Manager or Windows NT Server domain, double-click your left mouse button on the **LAN Server Logon** object. OS/2 Warp 4 will display a dialog like that shown in Figure 161.

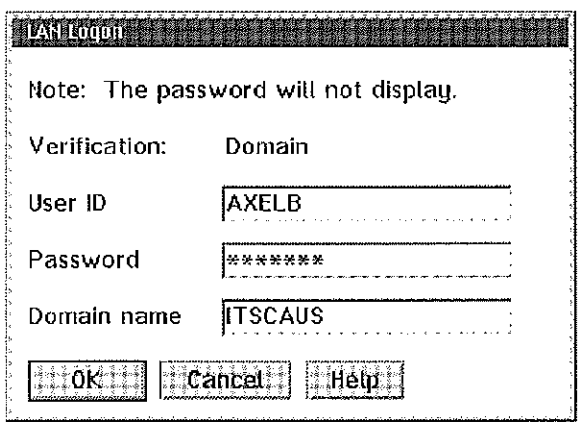


Figure 161. Logon for a Server Domain

This dialog is similar to that shown in Figure 160, but includes an additional field to specify the domain to which you want to log on. Again, enter your user ID, password and required domain, and select the **OK** button to complete the logon.

5.2.3.5 Logging on to Novell NetWare

Novell NetWare generally uses the term *login*, rather than *logon*, to refer to the process of providing your user ID and password, and gaining access to a server. For consistency with the online documentation and with Novell's own NetWare Server documentation, we will use the term *login* when referring to NetWare.

Log in using the Novell NetWare Client is slightly different from the process for the File and Print Client. When you have the Novell NetWare Client installed on your OS/2 Warp 4 system, you will see a network drive L: in your Drives folder. The login program LOGIN.EXE resides on this network drive in the OS2 subdirectory. To log in to your NetWare server, you must open this network drive, then start the LOGIN.EXE program by double-clicking your left mouse button on its icon. Using this method you are prompted to enter your user ID within an OS/2 command line window. The better way to get access to your Novell servers is to simply use the Novell NetWare Resource Browser. If you are not already logged on, OS/2 Warp 4 will start the Login window as shown in Figure 162 on page 318.

For details on logging onto a NetWare 4.X NDS network, go to 5.4.1.2, "Using OS/2 Warp 4 with NetWare Directory Services" on page 358. For more details on general NetWare login procedures, go to 5.4.2, "Logging in to a NetWare Server" on page 359.

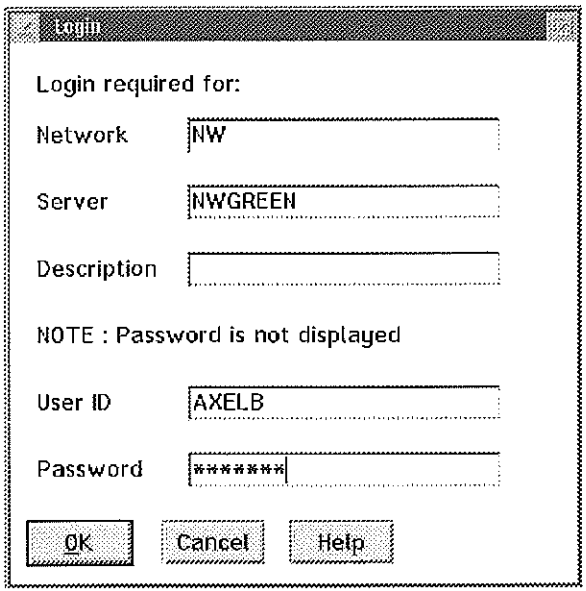


Figure 162. Login for a NetWare Server

In this window, you can enter the server to which you want to log in, and your user ID and password, then select the **OK** button to complete the operation.

5.2.3.6 Local Logon

In addition to the types of logon already described, you can log on to your own OS/2 Warp 4 system. This type of authentication is required by some local software products such as IBM's DB2/2, in order to grant you access to databases.

Local logon is performed using the LOGON command from an OS/2 command line, as follows:

```
LOGON /L
```

OS/2 Warp 4 will display a dialog like that shown in Figure 163 on page 319.

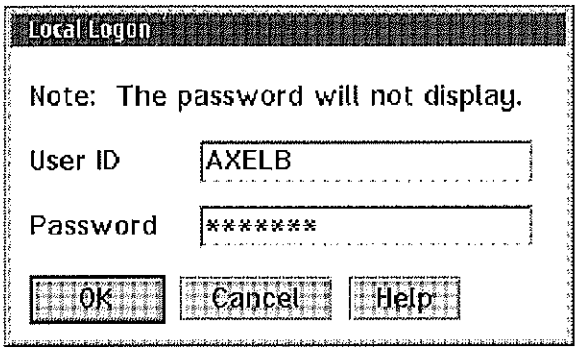


Figure 163. Local Logon

Enter your local user ID and password, and select the **OK** button to complete the logon. You can use local logon at the same time that you are logged onto your network, even with a different user ID and password, without affecting your network logon. You do not need to log off from the network in order to log on locally.

5.2.4 Managing Your User ID

To change the password for Peer Services or your IBM Warp Server domain, click on **Connections=> Network=> Network Services=> Logons=> Network User Account**. This also gives you information about your user ID. The Identity tab, as shown in Figure 164 on page 320, identifies your user ID and what domain you are currently logged on to.

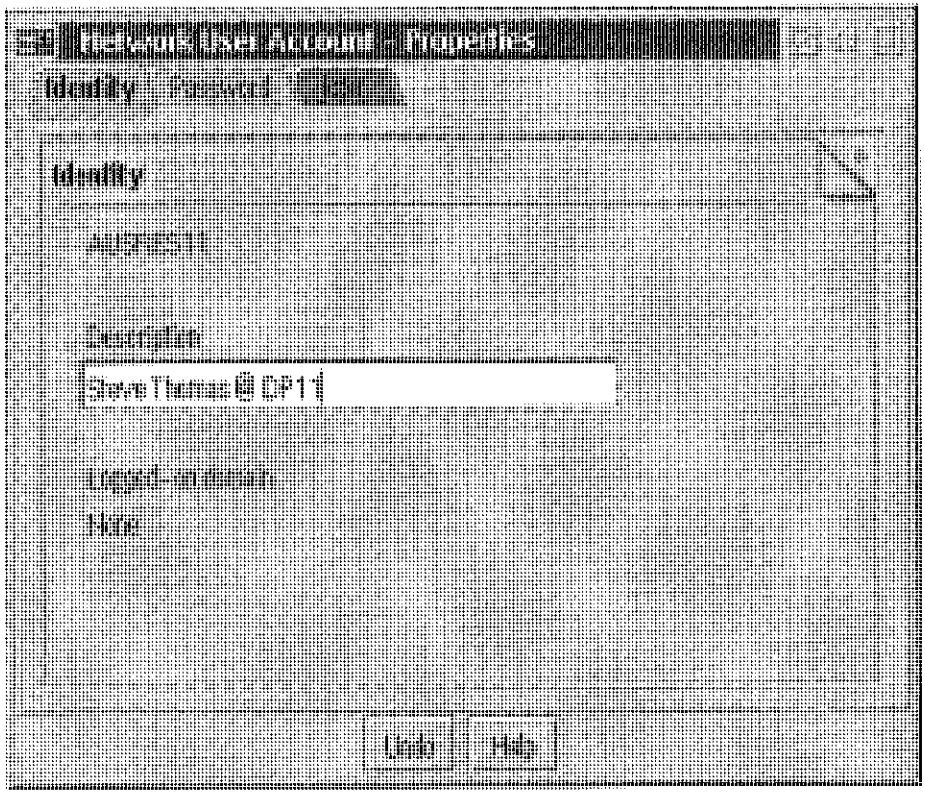


Figure 164. Network User Account Notebook - Identity

On the Password tab, as shown in Figure 165 on page 321, you can change your password.

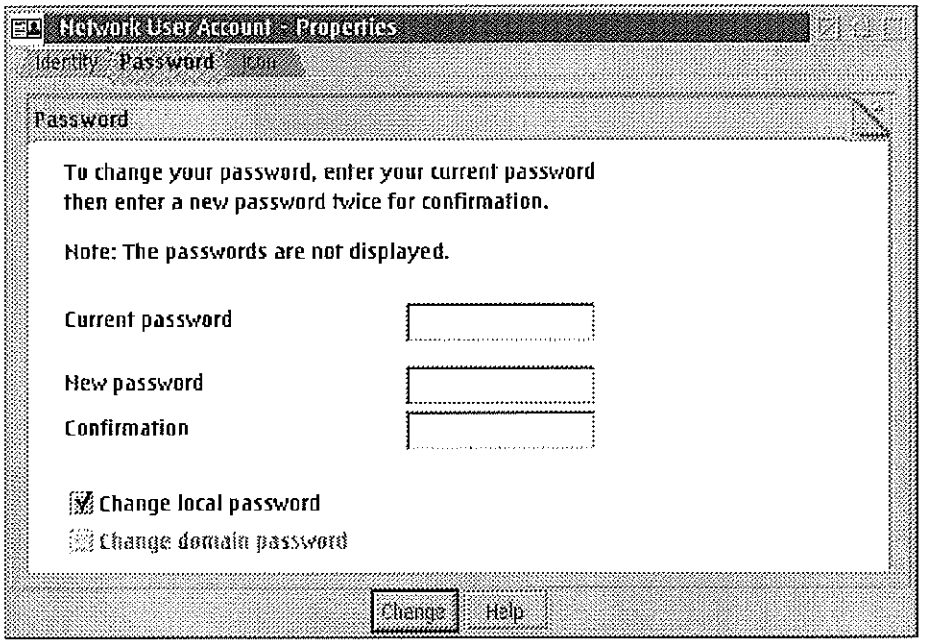


Figure 165. Network User Account Notebook - Password

If you are logged on to the LAN with local verification (that is, for peer networking only), you can only change your local password. If you are logged on to an IBM Warp Server or IBM LAN Server domain, you can change your password for that domain.

5.2.5 Logging Off

To log off, double-click your left mouse button on the **Logoff** object. If you are currently logged on with more than one user ID and password (for example, if you have both a local logon and a network logon active) OS/2 Warp 4 will display a dialog like that shown in Figure 166 on page 322, allowing you to log off from any or all of your current logons.

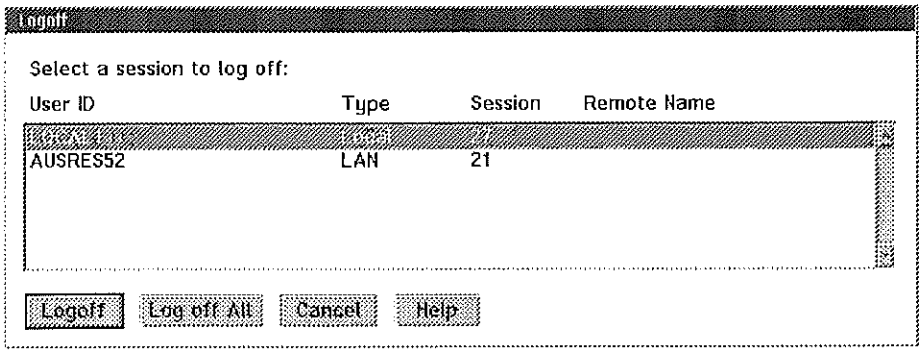


Figure 166. Logging Off

If you have only one logon currently active, this dialog will not be displayed, and OS/2 Warp 4 will simply log you off.

5.2.6 Browsing Available Network Resources

Within the Network folder, you will see one or two resource browsers. The File and Print Client Resource Browser allows you to view available network resources on a peer network or on IBM LAN Server, IBM Warp Server or Microsoft Windows NT Server domains, while the NetWare Resource Browser allows you to browse resources on Novell NetWare servers.

If you open either of these resource browsers without first logging on to the appropriate network environment, OS/2 Warp 4 will display a dialog asking you for your user ID and password.

Local Verification

If you open the **File and Print Client Resource Browser** and log on at this point, OS/2 Warp 4 logs you on to your peer network *only*. This means that you cannot browse any resources on servers, even though you may normally have access to them.

To avoid this problem, you should log on to your server domain before you open the **File and Print Client Resource Browser**. If you have the same user ID and password for your peer network and your server domain, you can use the resource browser to view both peer and server resources.

After you have logged on and opened the resource browser, you will see a folder such as shown in Figure 167 on page 323.

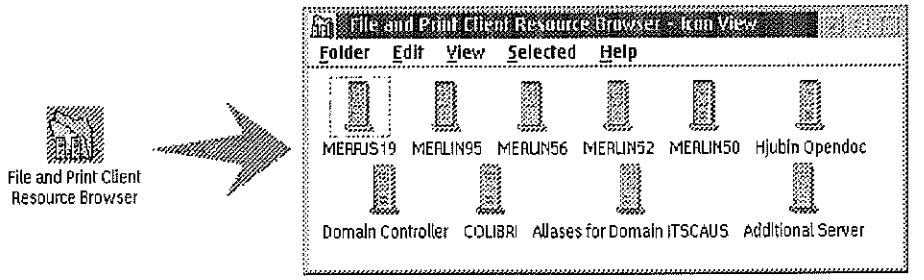


Figure 167. File and Print Client Resource Browser

This folder contains each of the servers and peer workstations on your network. If you are logged on to an IBM LAN Server, IBM Warp Server or Microsoft Windows NT Server domain, it will also contain an object which represents the aliases for that domain. You can access the resources on any peer workstation or server, or any alias in a domain, by opening the object that represents the workstation, server or domain.

5.2.7 Working Directly with Objects

You can work directly with the objects that represent network resources in the resource browser. For example, you can view the contents of a shared folder on a server, and move or copy files to or from that folder using drag-and-drop techniques. You can drag and drop a file on a printer attached to another system on a peer network, to print the file on that printer.

5.2.8 Accessing Resources Outside Your Domain

In the NetWare Resource Browser, all the resources on your current server or current tree (depending on whether you are using a NetWare 3.x or NetWare 4.x network) will be displayed. With the File and Print Client Resource Browser, however, peer workstations to which you have access are displayed, but only servers and aliases for the domain to which you are currently logged on are displayed in the resource browser's folder. This is known as the *browse scope.*

If you want to access a resource on a server that is not within your browse scope, click your right mouse button on any of the server objects in the resource browser window to display a context menu, and select the **Access Another...** menu item. OS/2 Warp 4 will display the Access another server window, such as shown in Figure 168 on page 324.

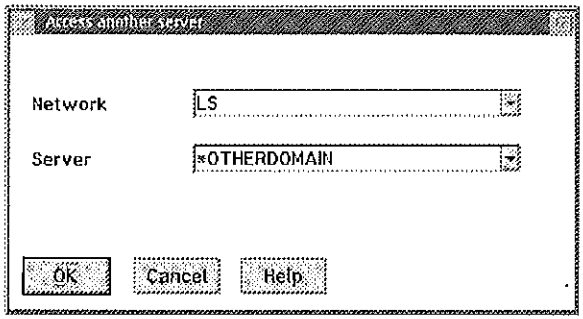


Figure 168. Access Another Server Window

All the servers within your browse scope are listed in the Server drop-down list, but you can enter a name of a server or peer workstation into this field, or the name of a domain. Note that if you enter a domain name, it must be preceded by an asterisk (*).

If you want the resources of another domain to be permanently displayed in your resource browser window, you should edit the file IBMLAN.INI, which resides by default in the \IBMLAN directory on your boot drive. Find the othdomains entry in this file, and add the name of the domain for which you want to display servers and aliases.

5.2.8.1 Assigning Drive Letters and Printer Ports

For the purpose of moving or copying files to or from directories on peer workstations or servers, or printing them on network-attached printers, you can simply work with objects in the resource browser as described in 5.2.7, "Working Directly with Objects" on page 323. However, if you wish to access such directories or printers from within an application, the application may require you to assign a logical drive letter or printer port.

You can do this from within the resource browser, by clicking your right mouse button on the resource to which you want to assign a drive letter or port, and selecting the **Assign Drive...** or **Assign Port...** item from the context menu. Note that only one of these items will be present, depending on whether the resource is a directory or a printer. Figure 169 on page 325 shows this technique being used for a directory.

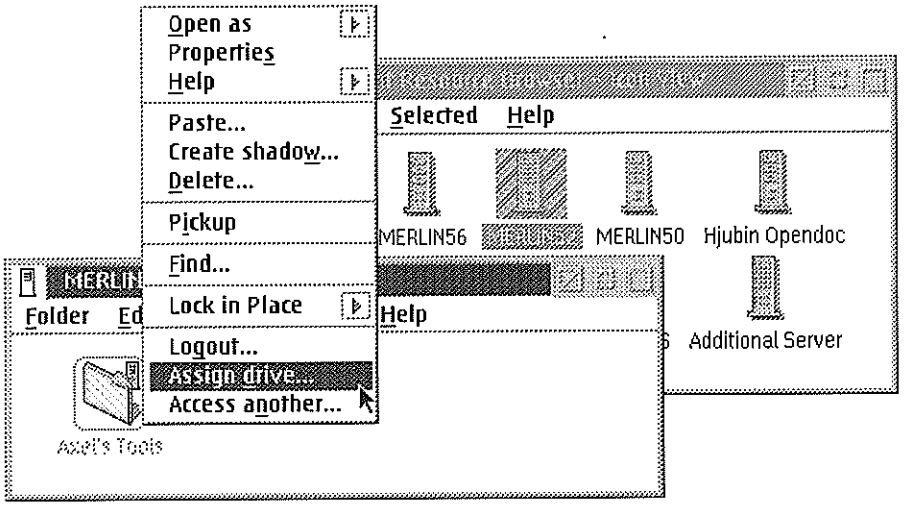


Figure 169. Pop-up Menu to Assign a Drive

When you select the **Assign Drive...** menu item, OS/2 Warp 4 will display a dialog such as shown in Figure 170, asking you which drive letter you wish to assign to this resource.

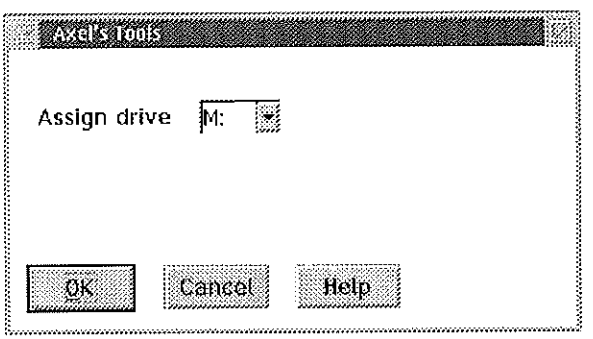


Figure 170. Assign Drive Window

The list in the window includes only those drive letters that are not already assigned. For example, if you already have drives C and D on your own computer, and another network drive T, then the list will include the letters E through S and U through Z.

After you assign a drive letter to a network directory resource, you can access the resource through any application, OS/2 command line or the Drives folder (see 5.2.1.1, "Network Drives" on page 307), using the drive letter.

The process of assigning a printer port is very similar to that of assigning a drive letter. OS/2 Warp 4 will display a dialog containing the ports that are not currently assigned, and ask you to choose a port. You can then access the network printer resource from within any application, command line or the Printers folder using that port. See 5.2.2, "Network Printers" on page 310.

5.2.8.2 Shadowing Network Objects on Your Desktop

While it is useful to be able to access network resources through the resource browsers, it is often much more useful to group resources, such as folders, on your desktop according to the subject matter that they contain. For example, you might have a Projects folder that contains folders for all your current work projects, regardless of whether those folders reside on your local system, another machine on a peer network, or a server.

You can drag objects from the resource browser windows into any folder on your desktop, so that you can group objects in the way that best suits your own needs. Effectively, OS/2 Warp 4 lets you expand your Workplace Shell desktop to encompass your network, while still allowing you to work in an easy, consistent manner.

Whenever you drag an object from a network drive or a resource browser window, the default operation is to create a shadow of the object. This differs from local objects, where the default operation is to move the object. This is shown in Figure 171, where the Tools on Merlin folder is shadowed.

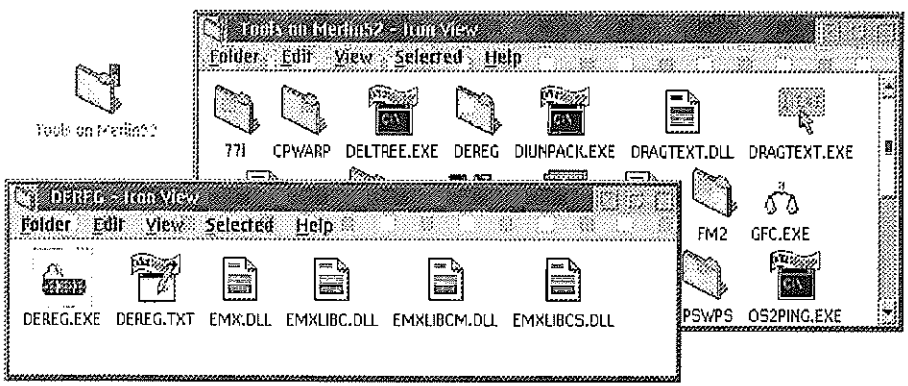


Figure 171. Shadowed Folder Contents

If you attempt to access an object that is a shadow of a network object, and you are not currently logged on to the network, OS/2 Warp 4 will automatically display a dialog asking you for your user ID and password, and will perform a logon for you.

Network objects can always be copied or shadowed, and you may delete the shadow if you no longer need it on your desktop. However, you can only move or delete the original (on another workstation or a server) if you have sufficient authority to do so.

5.2.8.3 Disconnecting from Network Resources

When you no longer require access to a network resource, you may want to disconnect from it, which frees up memory in your OS/2 Warp 4 system and in the peer workstation or server. In addition, some network resources only allow a limited number of users to access them at any one time, so disconnecting can allow other people to connect to the resource.

You can disconnect from a network resource using the resource's context menu, by selecting the **Unassign drive** or **Unassign port** menu items.

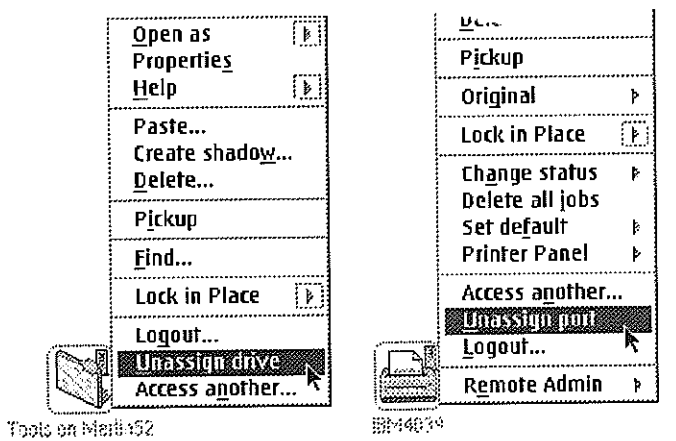


Figure 172. Unassigning Resources

After you unassign a drive letter or port, the resource will no longer be accessible. You can then assign that drive letter or port to another resource if you wish.

5.2.9 Network DDE and Clipboard

The network clipboard is an area of memory into which you can copy data, so that it can be shared with users on other systems attached to your network. The network clipboard also allows you to retrieve and store data from other users on the network. These pieces of data are known as *clippings*, and let you share several sets of data at the same time with users on other systems.

Dynamic Data Exchange (DDE) is a mechanism whereby applications can link with one another to share common data. When one application updates the data, the other application automatically reflects this update in its own copy of the data. While regular DDE links operate only within a single system, network DDE allows applications on different systems, connected by a network, to communicate in this way.

OS/2 Warp 4's Network Dynamic Data Exchange (DDE) and Clipboard utility extends DDE capabilities and the clipboard across the network. It enables users running various applications on their own systems to connect to other systems, sharing data through the clipboard and files saved from the clipboard.

Note that the Network DDE and Clipboard utility *does not* create a separate network clipboard. Instead, it allows other users to gain access to your own clipboard and allows you to access their clipboards. With the Network DDE and Clipboard utility, you can:

- Set access options
- Use and share data
- View current network connections
- Copy local data to your clipboard
- Copy the contents of a remote clipboard
- Save data as a clipping
- Copy and view a clipping
- Delete a clipping
- Link data over the network
- Allow links to data through your clipboard and clippings
- Link to data on a remote workstation
- Manage existing links

To start the Network DDE and Clipboard utility, double-click your left mouse button on the **Network DDE and Clipboard** object in the Network Services folder. OS/2 Warp 4 will display a dialog like that shown in Figure 173.

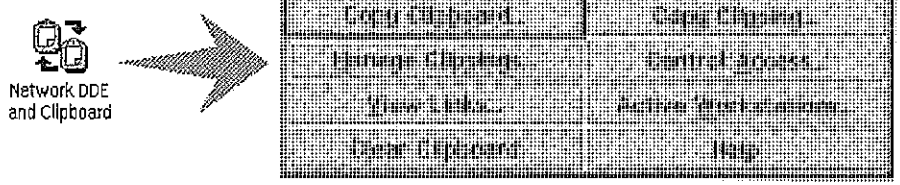


Figure 173. Network DDE and Clipboard

This window allows you to control the Network DDE and Clipboard utility, managing clippings and DDE links between your OS/2 Warp 4 system and other systems on your

network. The operation of this window is explained in the online help text; just select the **Help** button.

You may want to use only certain capabilities of the Network DDE and Clipboard utility. You can do this by selecting the **Control Access...** button. OS/2 Warp 4 will display a dialog like that shown in Figure 174.

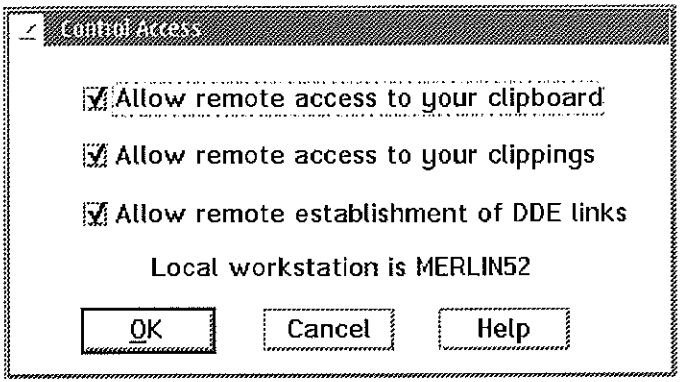


Figure 174. Network DDE and Clipboard - Controlling Access

Only those capabilities that you select in this window will be activated. For more information, see the online documentation for the File and Print Client.

5.2.10 Coordinating Passwords on Different Servers

OS/2 Warp 4 includes a Password Coordinator Client, which allows you to log on to multiple network environments (for example, IBM Warp Server and Novell NetWare) using a single user ID and password, and entering this user ID/password combination only once. In fact, the Password Coordinator Client is an IBM product named Network SignON Coordinator, which is packaged within OS/2 Warp 4 to perform this function. Network SignON Coordinator allows you log on to:

- IBM Warp Server and IBM LAN Server domains
- Novell NetWare servers
- Host systems such as MVS, VM and AS/400 (OS/400)
- Your local OS/2 Warp 4 system (as required by software such as DB2/2)

When you start Network SignON Coordinator, OS/2 Warp 4 will prompt you for your current user ID and password, which are then combined with information stored in Network SignON Coordinator's own configuration file to process your logon request.

Network SignON Coordinator provides a number of configuration options, including the ability to handle expired passwords and password changes. These options are

discussed in 5.2.10.2, "Configuring Network SignON Coordinator for LAN-Based Systems" on page 330.

5.2.10.1 Protecting Your Security

Network SignON Coordinator is not a security product; it is a productivity aid. However, since it does help you manage your passwords, care has been taken to avoid creating additional security exposures. Some things to note about Network SignON Coordinator are:

- Network SignON Coordinator assumes that you will use the same password at all locations to which you wish to log on. If your password is compromised, the security exposure may be greater since all locations can be accessed with that password.
- Network SignON Coordinator *can* remember your password once it has been entered, but *only* if the SAVEPW option is configured. By default, Network SignON Coordinator requires your to re-enter your password each time it is required.

  Your password is *always* discarded when you exit Network SignON Coordinator, even if SAVEPW is configured.
- Network SignON Coordinator does not hold passwords in "clear" in your system's memory, except when necessary to call external application programming interfaces. The password is masked using a simple reversible algorithm designed to prevent casual viewing of the password.
- Network SignON Coordinator does not send passwords to servers in "clear." The password is masked to prevent casual viewing of the password via network analyzers.
- Products supported by Network SignON Coordinator may send the passwords across the network using different techniques. For information on how passwords are communicated by these products, consult the appropriate documentation for that product.
- Network SignON Coordinator provides no security facilities of its own. After you have logged on to a server or network, your access to network resources is determined by the security and access control facilities of that server or network.

You should review the list above in light of your security requirements. If any of these points are unacceptable to you, you should not use Network SignON Coordinator.

5.2.10.2 Configuring Network SignON Coordinator for LAN-Based Systems

This section is about LAN-based environments, including IBM Warp Server, IBM LAN Server, NetWare and your local OS/2 Warp System.

By default, Network SignON Coordinator is configured for menu entry; that is, it will ask you to enter your user ID and password each time you run it. You can configure a number of options for data entry, including:

- Default user ID
- Minimum and maximum length for your user ID
- Minimum and maximum length for your password
- Sound (on or off)
- Menu shortcuts

Network SignON Coordinator stores its own configuration information in a file named NSC.INI. This file is a text file, so you can use an OS/2 text editor such as EPM or E (for example, type `EPM C:\NSC\NSC.INI` in an OS/2 window) to modify the file and customize the configuration. You can keep multiple copies of NSC.INI, but a copy must reside either in the current directory or in a directory specified in the `DPATH` statement in your OS/2 Warp 4 CONFIG.SYS file when you run Network SignON Coordinator.

The NSC.INI file does not come with any preconfigured server or host names. You must add entries for each network server or host system to which you want to log on. The default NSC.INI file contains only the following line:

```
LOCAL,ON
```

Each line in the file defines a configuration option or operation. Any line beginning with an asterisk is considered to be a comment and is ignored. Any text following the first blank (space) character on a line is considered to be comment text and is ignored.

A sample NSC.INI file is shown in Figure 175.

```
USERID=BALDRICK
EXIT,ID=1,NAME=D:\nsc\PEERPASS.CMD
LOCAL,ON,EXITID=1
LANSERVER,IBM,NAME=ANYDOM01,ON
LANSERVER,NOVELL,NAME=NW312,USERID=NWUSER
```

Figure 175. Network SignON Coordinator - NSC.INI File

This example defines a user ID of BALDRICK (line 1), which is then used to log on to a IBM LAN Server or IBM Warp Server domain named ANYDOM01 (line 4). The file also logs the user on to a Novell NetWare server named NW312, using the user ID NWUSER, rather than the previously defined user ID (line 5).

Note that although all the options in the example above are shown in uppercase, you can enter text into NSC.INI in uppercase, lowercase or mixed case.

The second line in the above example invokes a special procedure within Network SignON Coordinator, known as a user exit, which allows Network SignON Coordinator to change your passwords if you wish. This exit invokes the command file shown in Figure 176 on page 332.

```
@ECHO OFF
rem %1 = 0 for signon, 1 for signoff, 2 for change password,
rem %2 = Configuration definition index
rem %3 = Return code
rem %4 = User ID
rem %5 = Current Password
rem %6 = New Password
rem
rem exit if not a change password request
IF NOT %1 == 2 GOTO END
rem repeat the NET PASSWORD line with the name of all the peers that
rem you want to change your password on
NET PASSWORD \\BOBSMACHINE %4 %5 %6
NET PASSWORD \\PEERCO %4 %5 %6
:END
```

Figure 176. Network SignON Coordinator - Changing Your Password

If you decide to change your password on the Network SignON Coordinator Signon dialog, Network SignON Coordinator invokes this command file to perform the changes. Your user ID, old and new passwords are passed to this file in the order shown in the file, and the modifications are made using NET PASSWORD commands. You should modify these commands to reflect the names of the peer workstations on which you will want to change your password.

The following table provides details of the NSC.INI options that you can set.

Table 5 (Page 1 of 2). Network SignON Coordinator - Configuration File Options

Option	Description	Valid Range	Default Value
USERID[1]	Specifies the user ID to be used for signon operations	Any character that is part of the user ID character set	none
CHARSET[2]	Specifies characters (other than alphanumerics) that are valid in user IDs and passwords	Graphic ASCII characters, other than a space	All alphanumeric characters plus the non-alphanumeric characters #, @ and $
MINUIDLEN	Defines the minimum user ID length	1 to 8 characters	4 characters
MAXUIDLEN	Defines the maximum user ID length	1 to 47 characters	8 characters
MINPWLEN	Defines the minimum password length	1 to 8 characters	5 characters
MAXPWLEN	Defines the maximum password length	1 to 8 characters	8 characters

Table 5 (Page 2 of 2). Network SignON Coordinator - Configuration File Options

Option	Description	Valid Range	Default Value
BEEP	The BEEP option allows the user to turn on or off the beeps that are sounded when error messages are displayed or invalid keys are pressed	ON, OFF	ON
SIGNON[3]	Causes the Signon dialog to immediately be displayed when the PM interface (NSC.EXE) is started	none	none
SAVEPW[4]	Specifies that the end user's password should be recorded and used for subsequent password requests in this session	ON, OFF	OFF
CONFIRMEXIT	Defines whether a warning message is displayed before Network SignON Coordinator exits	ON, OFF	OFF
DEBUG[5]	Specifies that additional information should be logged when a problem occurs	none	none

Notes:

1. Lowercase alphabetic characters in the default user ID will be converted to uppercase. The user ID entered in the Network SignON Coordinator Signon menu becomes the default user ID for each system specified with a DOMAIN, HOST or LOCAL operations. This user ID may be overridden in any of these operations by specifying the USERID parameter for the operation.
2. This option is useful when you use the UPMCSET /E command to extend the user ID character set. You cannot specify the alphanumeric characters A through Z, a through z, and 0 through 9. Only graphic ASCII characters other than a space can be specified (they are 0x21..0x7E, 0x80..0xFE). Lowercase extended ASCII characters should be avoided, as they will not be converted to uppercase, and may thus not give the desired result when passed to UPM or LAN. You can specify up to 159 characters. This is enough to specify all the non-alphanumeric graphic ASCII characters. No check is made for duplicate characters.
3. When specified, the equivalent action of using the mouse to select **Actions**, **Signon**, and **Default Systems** is performed.
4. If you select the **Default Signons** or **Change Password** actions, the previously entered password is used. The password is not stored on disk, but hidden and masked in memory. When Network SignON Coordinator is closed, the saved password is no longer available.
5. This option should be specified only for problem determination purposes, since user request processing is slower with this option defined.

The following is a list of the configuration and signon options defined in the configuration file.

Use the keyword	**To specify**
LOCAL	UPM Local signon
NODE	UPM Node signon
LANSERVER	IBM LAN Server, IBM Warp Server or NetWare logon
HOST	Host system signon

SERVER NSC/2 Server machine

The order of the operations is very important since Network SignON Coordinator executes them in order. The SERVER definitions are also stored in the configuration file. Their position in the file relative to the signon operations determines where the signon operations are executed.

For more information on configuring Network SignON Coordinator, see the online *Network SignON Coordinator Reference.*

5.2.10.3 Configuring Network SignON Coordinator for Host-Based Systems

This section covers setting up the Network SignON Coordinator for host-based systems such as MVS, VM and OS/400. You can also configure VM with OfficeVision and the IBM Information Network but these won't be covered here (refer to the online NSC Help for further information on these).

NSC uses a host information file (HIF) to process requests for a host emulator session. NSC reads what is on the emulated terminal panel and inputs keystroke information just as if you had pressed the keys on the keyboard. You can use the host information file to tell NSC how to interpret the panel information and what to send the host computer system.

The host information file is a flat ASCII file that you may change using any ASCII editor (for example, the OS/2's E or EPM). If you do not identify the host information file using the HIF parameter on the HOST definition, then the host information file must reside in the same directory as NSC.INI and have a file extension of INI.

NSC provides sample host information files for MVS, VM, and OS/400 host emulator sessions. You may be able to use one of these sample host information files with your host emulator session without making changes. To configure a host emulator connection, follow these steps:

1. Refer to the host information file for your system in "Host Information Files" below. Read the instructions for using the host information file. More details on how to do this are in the NSC online documentation.
2. Make a copy of the sample host information file.
3. Configure your HOST definition in the NSC configuration file (NSC.INI) using the copy of the host information file. See 5.2.10.4, "Sample NSC.INI Configuration File" on page 336.
   - Specify the HIF filename
   - Specify the HIF variable for the session ID
   - Specify any other HIF variables required for the sample host information file

4. If you have more than one host account, repeat step 3 for each account. Be sure to specify a unique hostname and session ID for each unique host. If you have multiple user IDs on the same host, or if you have more accounts than available session IDs, refer to the NSC online help on how to assign session IDs.

Host Information Files

- **MVS Host System**

  NSCMVS.HIF, located in the NSC directory, is a host information file for an MVS host system. It defines start and stop panels for the standard TSO prompts. It uses a RACF command to change the host password. If your host system does not use RACF, you will need to modify the host information file based on the host security software program used. To sign on to the host, it sends the node ID of the host (you specify this as a HIF Variable in the HOST definition) followed by your user ID. NSCMVS.HIF has two HIF variables:

  - V1 defines the host session ID (for example, V1=A)
  - V2 defines the node ID sent for a signon with the user ID (for example, V2=TSO1)

  The following is an example of a HOST definition put in the NSC.INI file which uses this host information file:

```
USERID=PDQUEUE
Host,EMULATOR,Name=TSO1,ON,HIF=d:\nsc\nscmvs.hif,V1=A,V2=TSO1
```

  In this example, `V1=A` specifies host emulator session A will be used for the host TSO1 and `V2=TSO1` specifies that the initial connection to the host will be made by sending the string `TSO1 PDQUEUE` to the emulator.

- **VM Host System**

  NSCVM.HIF, located in the NSC directory, is a host information file for a VM host system. It defines start and stop panels for the standard CMS prompts. It uses a RACF command to change the host password. If your host system does not use RACF, you will need to modify the host information file based on the host security software program used. To sign on to the host, it sends the node ID of the host (you specify this as a HIF variable in the HOST definition) followed by your user ID. NSCVM.HIF has two HIF variables:

  - V1 defines the host session ID (for example, V1=A)
  - V2 defines the node ID sent for a signon with the user ID (for example, V2=AUSVM2)

  The following is an example of two HOST definitions put in the NSC.INI file which uses this host information file:

```
USERID=PDQUEUE
Host,EMULATOR,Name=VM2,ON,HIF=d:\nsc\nscvm.hif,V1=B,V2=AUSVM2
Host,EMULATOR,Name=VM6,ON,HIF=d:\nsc\nscvm.hif,V1=C,V2=AUSVM6
```

In this example, `V1=B` specifies host emulator session B will be used for the host VM2, and `V2=AUSVM2` specifies that the initial connection to the host will be made by sending the string `AUSVM2 PDQUEUE` to the emulator.

The host VM6 is defined in a similar way using the same host information file.

- **OS/400 Host System**

  NSCOS400.HIF, located in the NSC directory, is a host information file for an OS/400 system. It defines start and stop panels for the OS/400 menu system. It uses the chgpwd command to change the password. To sign on to the host, it uses the OS/400 initial signon panel. NSCOS400.HIF has one HIF variable:

  ```
  V1 defines the host session IO (for example V1=A)
  ```

  The following is an example of HOST definition put in the NSC.INI file which uses the host information file:

  ```
  USERID=PDQUEUE
  Host,EMULATOR,Name=AS400,ON,HIF=d:\nsc\nscos400.hif,V1=D
  ```

  In this example, `V1=D` specifies host emulator session D will be used.

5.2.10.4 Sample NSC.INI Configuration File

The following configuration file shows several configuration definitions for both LAN and host and illustrates how the placement of definitions for host connections is significant.

Sample NSC.INI File

```
*      NSC Configuration File for Paul D. Queue
USERID=PDQUEUE             Default User IO
*                               Passwords on VM1A and VM2B must be
MINPWLEN=5                  - at least five chars long, and
MAXPWLEN=6                 - no more than six.
BEEP=OFF                     Run quietly
LOCAL,ON                      Local UPM
NODE,NAME=DBM03,ON        Node logon for OBM
*                               Signon to VM1A 3270 Session
HOST,EMULATOR,NAME=VM1A,ON,HIF=d:\nsc\nscvm.hif,V1=A,V2=AUSVM1
*                               Signon to VM2B 3270 Session
HOST,EMULATOR,NAME=VM2B,ON,HIF=d:\nsc\nscvm.hif,V1=B,V2=AUSVM2
*                               Signon to LAN Server LANSYS04
LANSERVER,IBM,NAME=LANSYS04,ON
*                               LAN Server LANSYS07 (no signon)
LANSERVER,IBM,NAME=LANSYS07
SERVER,NAME=DBM03        OS/2 Database Server/Gateway
*                               Route everything behind this to
*                               NSC Server OBM03
LOCAL                          Change UPM passwords at DBM03
HOST,APPC,NAME=MVSSYS01,ON   OB2 Host pswd verify and changes
```

This is a customized configuration file for Mr. Paul D. Queue. Comments in the configuration file explain most of the definitions. The user ID character set definition is not specified, since "PDQUEUE" is the only user ID Mr. Queue will ever use, and the default character set is acceptable for passwords as well. Since he always allows the user ID to default, the minimum and maximum user ID length are not a concern.

Mr. Queue has specified the LOCAL definition with the ON parameter, requesting a local logon at signon. He has also specified the NODE definition with the ON parameter, requesting a node logon at signon for the OS/2 Database Manager at the DBM03 workstation.

The first two HOST definitions precede the first SERVER definition and are accessed via 3270 emulation sessions from Mr. Queue's workstation. The sample host information file NSCVM.HIF will be used to log Mr. Queue on to both hosts at signon, since the HOST definition specifies the ON parameter for both of these hosts.

Mr. Queue is defined on two IBM LAN Server domains. He wants to be signed on to LANSYS04 at signon, so he has specified the ON parameter in the LANSYS04 LANSERVER definition. The other LANSERVER definition is specified without the ON parameter, so that only password changes are made on the LANSYS07 domain.

Finally, Mr. Queue uses Extended Services Database Manager to access a remote database. The computername of the database server is DBM03. He also uses Distributed Database Connection Services/2 (DDCS/2) to access a DB2 database using the database server as a gateway. To synchronize his passwords on the database server and on the MVS host where DB2 resides, Mr. Queue specifies a SERVER definition followed by a LOCAL definition and a HOST definition. Specifying the LOCAL definition after the SERVER definition indicates a UPM password change is processed at DBM03 (an NSC Server). Specifying the HOST definition after the SERVER definition indicates the host connection is from DBM03. An APPC profile MVSSYS01 has been defined in the Communications Manager configuration on DBM03 to send password changes to the host.

5.2.10.5 Using Network SignON Coordinator

To start Network SignON Coordinator on your OS/2 Warp 4 system, click on **Programs=> Utilities=> Network Services**, as shown in Figure 177 on page 338.

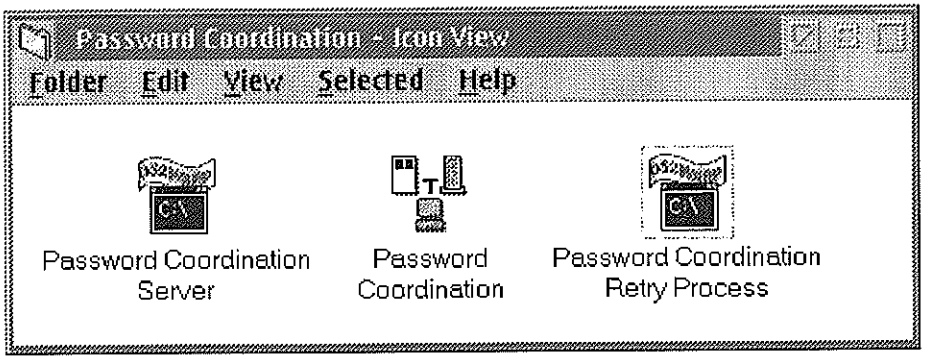


Figure 177. Password Coordinator Folder

Start Network SignON Coordinator by double-clicking your left mouse button on **Password Coordination**. in the folder. OS/2 Warp 4 will start Network SignON Coordinator and display the Signon dialog, allowing you to enter your user ID and password.

5.2.11 Network Messaging

The Network Messaging utility allows you to send messages to, and receive messages from, other users on the network. The Network Messaging utility function uses the messenger service, which is part of the File and Print Client, to accomplish these tasks.

Functions that you can perform using the Network Messaging utility are:

- Read messages
- Reply to messages
- Send a new message
- Delete messages
- Configure the Network Messaging utility

You can send messages to users who are logged on, or to systems that are started and running the messenger service. You must be logged on to be able to send and receive messages addressed to you, but you will receive messages sent to your OS/2 Warp 4 system (using the computer name that you specified when you installed the File and Print Client) provided you have started the File and Print Client and are running the messenger service.

The Network Messaging utility is added to the Startup folder when you install the File and Print Client, and will therefore be started whenever you boot your OS/2 Warp 4 system. If you do not wish to start the utility every time you start OS/2 Warp 4, you should remove it from the Startup folder.

The Network Messaging utility starts as a minimized window which, if you select it from the Window List, appears as shown in Figure 178 on page 339.

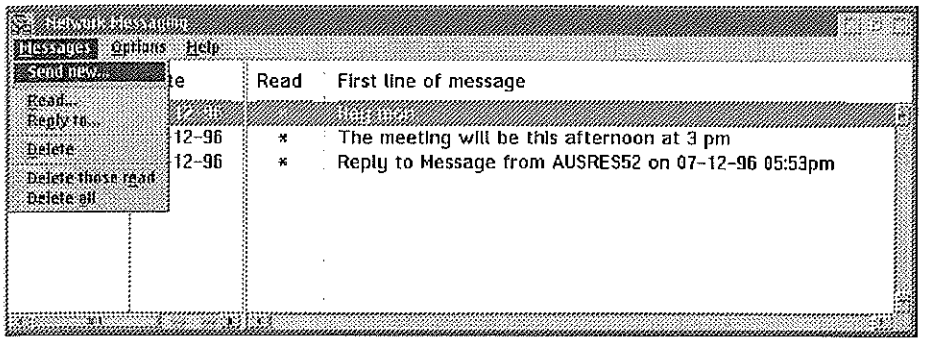


Figure 178. Network Messaging Utility

When a new message arrives on your workstation, the messenger service adds it to the list of messages waiting to be read in the Network Messaging window. If you have chosen the **Pop-up on message arrival** option (see Figure 179), the messenger service informs you of its arrival with a pop-up window.

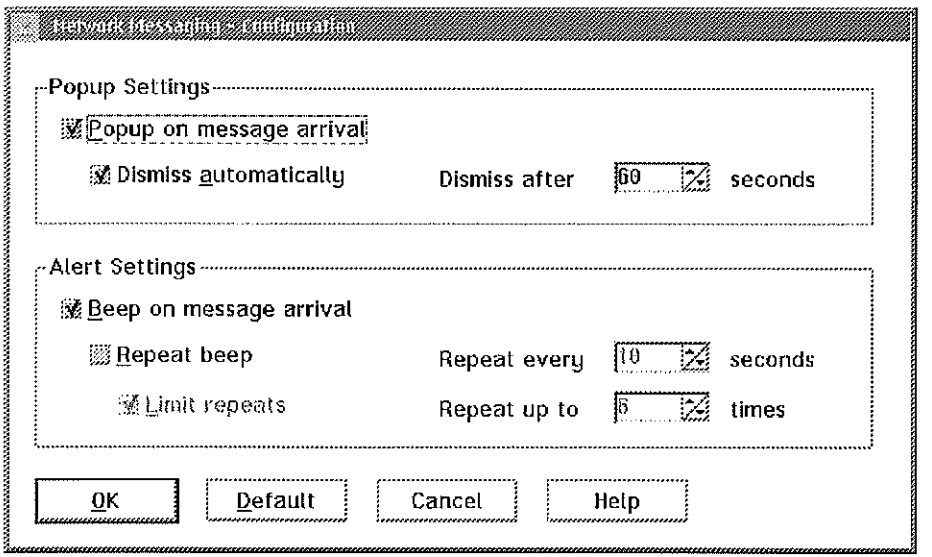


Figure 179. Network Messaging Utility - Configuration

You can configure the Network Messaging utility so that messages arrive without notification, or to remind you that a message has arrived and has not been answered, as shown in Figure 179. All messages that you receive are automatically stored in a message log, and remain there until you delete them.

To reply to a message, highlight the message in the Network Messaging window and select the **Reply to...** item from the Messages pull-down menu. OS/2 Warp 4 will display a window allowing you to enter the text of your message.

Select the **Send...** button when you are finished, and OS/2 Warp 4 will display a window allowing you to specify the destination or destinations (there can be more than one) for your message. If you are logged on to a peer network, the Destinations list shows users and groups of users that you have defined on your system as possible recipients of messages. For details on defining users and groups in this way, see "Defining a New User" on page 396 and "Defining a New Group of Users" on page 398. If you are logged on to a server domain and you have administrator authority for that domain, the Destinations list shows all the users and groups of users defined on that domain. However, if you do not have administrator authority, the list will be blank.

The online *File and Print Client User's Guide* provides more information on how to use the Network Messaging utility.

5.2.12 Auditing Network Access

When you install the File and Print Client and connect to a peer network, OS/2 Warp 4 provides you with the ability to keep a record of the resources that you share on the network, and who accesses them. This record is called an *audit log*.

You can choose which network resources you want to audit, and then use the audit log information for accounting, security administration, studying network use, or problem determination. To audit a particular resource, you must turn on the auditing options when you create an access profile for the resource. This is described in 5.5, "Peer Networking" on page 382.

The audit log may contain entries for any of the following events:

- Service state changes
- Successful and unsuccessful requests for session connection
- Successful and unsuccessful requests for peer logon
- Successful and unsuccessful share requests
- Changes to user and group accounts database
- Changes to the access control database
- Resource access as defined by resource auditing options
- Logon limit violations

You can view the information in the audit log using the Audit Log Utility in the Network Services folder. An example of an audit log displayed with this utility is shown in Figure 180 on page 341.

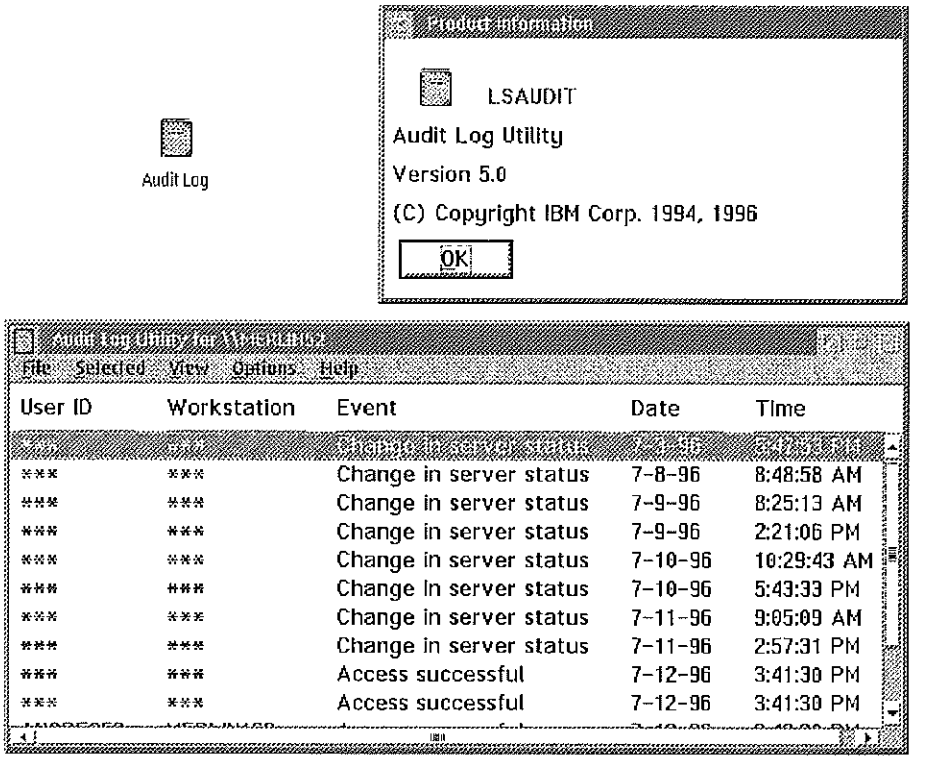


Figure 180. Audit Log Utility

You can select an event from the audit log by double-clicking your left mouse button on its entry in the list. OS/2 Warp 4 will then display the Audit Log Details window, as shown in Figure 181 on page 342, to provide more information about that event.

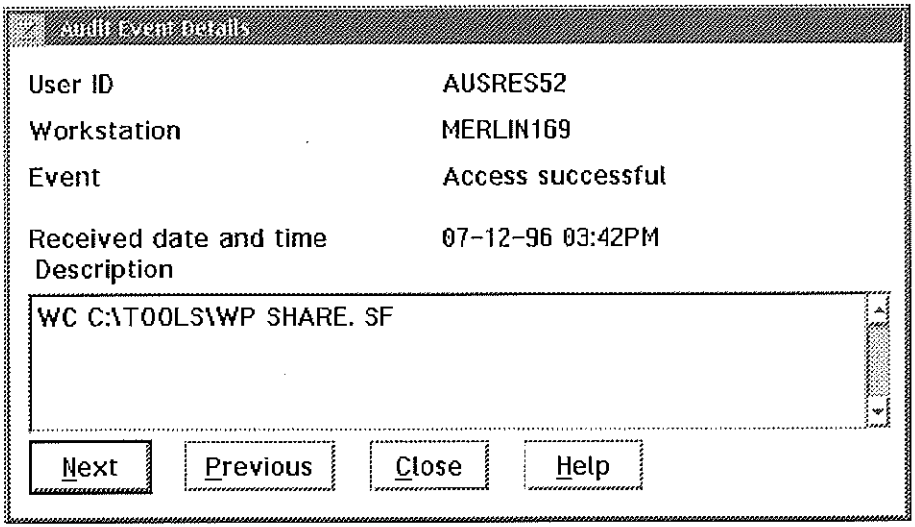


Figure 181. Audit Log Details

You can access the audit log of another system on your network. However, you must be logged on to the network with a user ID and password that has administrator authority on that machine.

The *File and Print Client User's Guide* and the *IBM Warp Server User's Guide* provide more detail on using the Audit Log Utility.

5.3 Accessing IBM Warp Server and Microsoft Windows NT Server

OS/2 Warp 4 allows you to access network resources on server systems running IBM Warp Server and Microsoft Windows NT Server. You can access these servers using the same components of OS/2 Warp 4 that you use for peer networking (see 5.5, "Peer Networking" on page 382), and you can connect to network resources on these servers in the same way as you connect to peer network resources.

Note that this type of network is more rigidly controlled than a peer network. Only specific computers, known as *servers*, share their resources. While other computers on the network, known as *clients* or *requesters*, may access resources on the servers, they do not share resources of their own. This provides a greater level of control over information and devices being shared across the network. Important resources can be grouped in one or more places, with appropriate measures for security and backup.

Note that OS/2 Warp 4 allows you to combine these types of network. You can use peer services to share your resources and access those of other users on the network, while accessing resources on servers at the same time.

5.3.1 Domains

IBM Warp Server and Microsoft Windows NT Server networks are organized into *domains*. A domain is simply a collection of network resources, which may reside on one or more servers within a network, and is normally set up and run by a network administrator. When you wish to access one or more of these resources, you log on to the domain, and you can then gain access to any network resource to which your network administrator has granted you access.

A domain typically consists of the following types of computer:

- A primary server called the *domain controller*, which keeps the master copies of user and resource definitions, as well as access control information. The domain controller can also share its own resources and, in smaller networks, may be the only server in the network. There must be one and only one domain controller in a domain
- Optional additional servers to provide shared resources and serve as backup domain controllers if necessary.
- A number of clients, from which users can access shared resources on the servers.

When you are accessing servers from your computer, your computer is the client. For this reason, the component of OS/2 Warp 4 that provides the server connection is known as the File and Print Client.

Setting up a domain is the responsibility of a network administrator. The network administrator sets up the servers, defines network resources and user IDs, and sets access control privileges so that users can access the resources. The many tasks involved in administering an IBM Warp Server or Microsoft Windows NT Server network are beyond the scope of this book, so we will not discuss them here.

5.3.1.1 Network Drives

A server may share its disk drives or directories on the network, and you can access these resources as network drives. For example, a server may share its \APPLS\WPERFECT directory on the network, and you might access this resource as drive P: on your OS/2 Warp 4 system.

You can access network drives in a number of ways:

- You can use resource browsers within the Network folder on your desktop to browse the list of available network resources. You can then use drag-and-drop techniques to work directly with the resource
- You can assign a logical drive letter to the resource (or the network administrator can tell the server to automatically assign one for you when you log on). You can

then access the resource from your desktop, from within an application or from a command line, just as if it were a logical drive on your computer.

When you access a network drive using OS/2 Warp 4 and assign a logical drive letter to it, the drive will then appear in the Drives folder within the OS/2 System folder on your desktop. OS/2 Warp 4 uses a slightly different icon for network drives, to differentiate them from local drives. The process of locating resources and assigning drive letters is described in 5.2, "Local Area Network (LAN)" on page 305.

Note that a resource can appear as a logical "drive" on your computer, but in fact be only a directory or subdirectory on the server. The mapping of resources between the server and your computer allows this translation to take place.

5.3.1.2 Network Devices

A server may share its printers or serial devices (comms ports) on the network, and you can access these resources as network devices. Network devices are similar to network drives in the way that you access and use them. You can use the Network folder on your desktop to access the resource directly, or you can assign a local port name to it (such as LPT2: or COM2:) and access it as though it were directly attached to your printer. This process is described in 5.2, "Local Area Network (LAN)" on page 305.

5.3.1.3 Network Applications

A network administrator may set up certain applications on a server, which you are able to access and run when you log on. These are known as network applications. They reside in a special Network Applications folder that appears on your desktop when you log on to a domain, and disappears again when you log off.

Note that you cannot locate network applications using the resource browsers described in 5.2, "Local Area Network (LAN)" on page 305. Your network administrator must grant you access to network applications before you can use them.

You start network applications in the same way as any other applications under OS/2 Warp 4. Simply open the Network Applications folder, locate the icon for the application you want to start, and double-click your left mouse button on that icon.

5.3.2 Starting the File and Print Client

OS/2 Warp 4 normally starts the File and Print Client when you boot your system. However, you may not want to connect to servers every time you boot, so you can disable this automated startup and start the File and Print Client manually when you wish to connect to servers.

You can start the File and Print Client in three ways:

- If you try to access a network resource before you log on, OS/2 Warp 4 will start the File and Print Client automatically and ask you for your user ID and password

- You can double-click your left mouse button on the **Start File and Print Client** icon located in the Logons folder. The Logons folder resides in the Network Services folder within the Connections folder on your desktop. Selecting the **Start File and Print Client** object will run a command file that starts the requester for you.
- Go to a command line and issue the following command:

  ```
  NET START REQ
  ```

  This will start the File and Print Client.

When the File and Print Client services are starting, you are presented with the information panel in Figure 182.

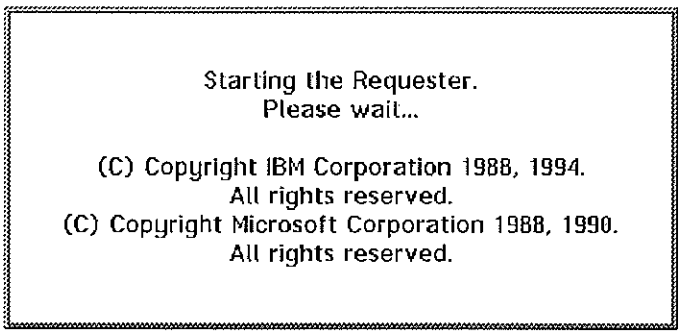


Figure 182. Starting Network Services

Be patient while this task is starting since, depending on the configuration of your network, it may take one or two minutes to locate the domain controller and authenticate your access.

5.3.3 Logging on to a Domain

Before you can access resources on servers in a domain, you must first identify yourself to the domain controller, which then determines which resources you are allowed to access. To do this, you must log on to the domain. The domain controller checks your user ID and password, and then authorizes you to access resources. Note that these resources may reside on the domain controller itself or on different servers in the domain. The exact location of the resource is transparent to you.

You can log on to the domain in any one of three ways:

- As discussed in 5.2, "Local Area Network (LAN)" on page 305, OS/2 Warp 4 will automatically start the File and Print Client and ask you to log on if you attempt to access a network resource without first logging on.

Note: This is the most intuitive way to gain access to any network resource, since you do not need to do anything special to start the File and Print Client; simply work with your Workplace Shell objects in the normal way.

- Double-click your left mouse button on the **LAN Server Logon** icon located in the Logons folder. The Logons folder resides in the Network Services folder within the Connections folder on your desktop. This will start the *logon* process and present you with a dialog as shown in Figure 183.
- Go to a command line and issue the LOGON command.

While your network may contain multiple domains, you can log on to only one domain at a time. If you are logged onto a domain and need to access resources on a different domain, you can do so provided that you have a user ID and password defined on the domain controller for that domain, and that the user ID and password for that domain are identical to those for the domain in which you are currently logged on.

In using one of the above-mentioned methods, OS/2 Warp 4 will display the following Logon dialog window.

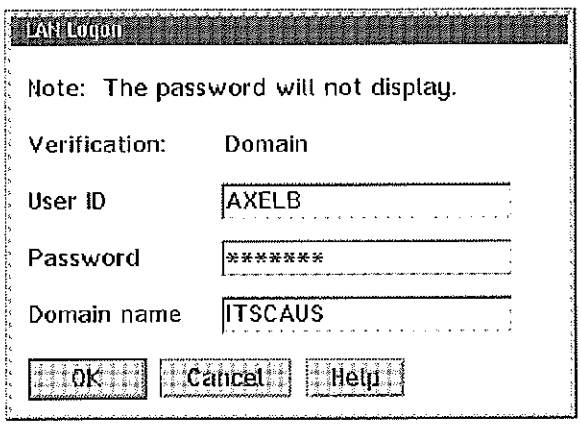


Figure 183. LAN Logon Window (Logon to IBM Warp Server)

In this dialog, you must enter your user ID and password, as well as the name of the domain to which you want to log on. By default, the domain name provided in the logon dialog is obtained from the \IBMLAN\IBMLAN.INI file on your boot drive, using the domain name you provided during OS/2 Warp 4 installation.

5.3.4 Connecting to Network Resources

Before you can use a network resource, your network administrator must grant you access to that resource. Accessing resources on servers differs slightly from accessing

resources on peer networks, since this rule applies to printers and serial devices as well as to disks and directories.

OS/2 Warp 4 allows you to connect to a resource in three ways:

- Use the File and Print Client Resource Browser object
- Use the Network User Account object
- Use the NET USE command from the command line

The NET USE command will not be discussed here. See the online documentation for the File and Print Client if you need more information on this command.

5.3.4.1 Using the File and Print Client Resource Browser

See 5.2.6, "Browsing Available Network Resources" on page 322 for information on how to use the Workplace Shell to gain access to network resources by using the File and Print Client Resource Browser object. Note that this method is identical to the one you use to connect to resources on peer networks.

5.3.4.2 Using the Network User Account Notebook

You can connect to network resources using the Network User Account object. This is the same object that you use to maintain your password information as described in 5.2.4, "Managing Your User ID" on page 319.

You can use the Network User Account notebook to connect to network resources, but the preferred way to do this is using the File and Print Client Resource Browser. The primary advantage of using the Network User Account notebook, however, is that any assignments you make from this notebook become permanent, so that you no longer need to reconnect to them each time you log on.

There are two tabs in the notebook that show your current network applications and logon assignments. The first of these is the Applications tab, as shown in Figure 184 on page 348.

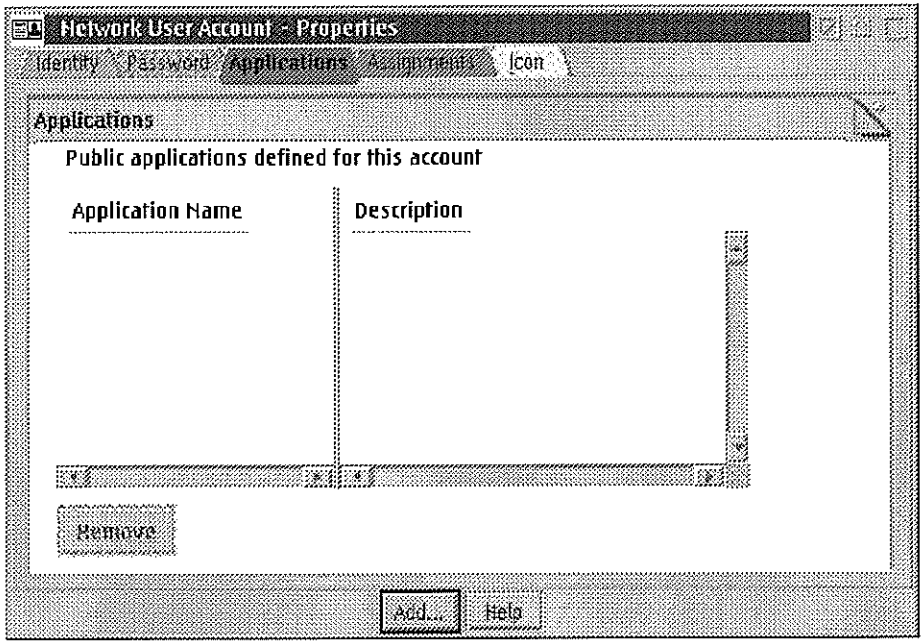


Figure 184. Network User Account Notebook - Applications

This tab shows the network applications to which you currently have access. You can add applications to your Network Applications folder if you wish, using the **Add...** button at the bottom of the page. You can also remove existing applications by selecting them in the list and clicking the **Remove** button.

The second tab that affects your access to network resources is the Assignments tab, as shown in Figure 185 on page 349.

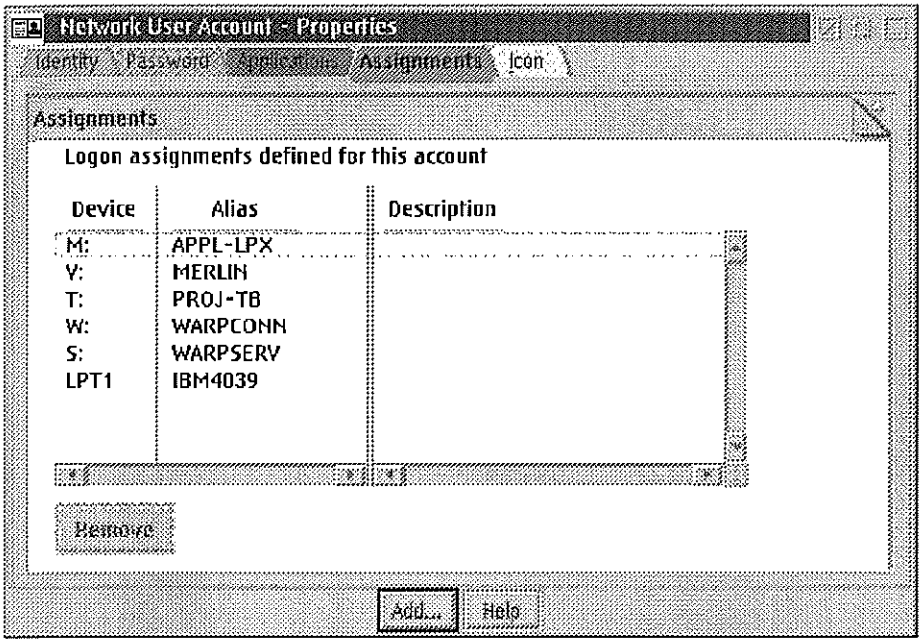


Figure 185. Network User Account Notebook - Assignments

If there are any network drives or printers on the LAN that are defined as being available to public access, you can add these resources to your current assignments by using the **Add...** button. OS/2 Warp 4 will display the Add a Logon Assignment dialog, as shown in Figure 186 on page 350.

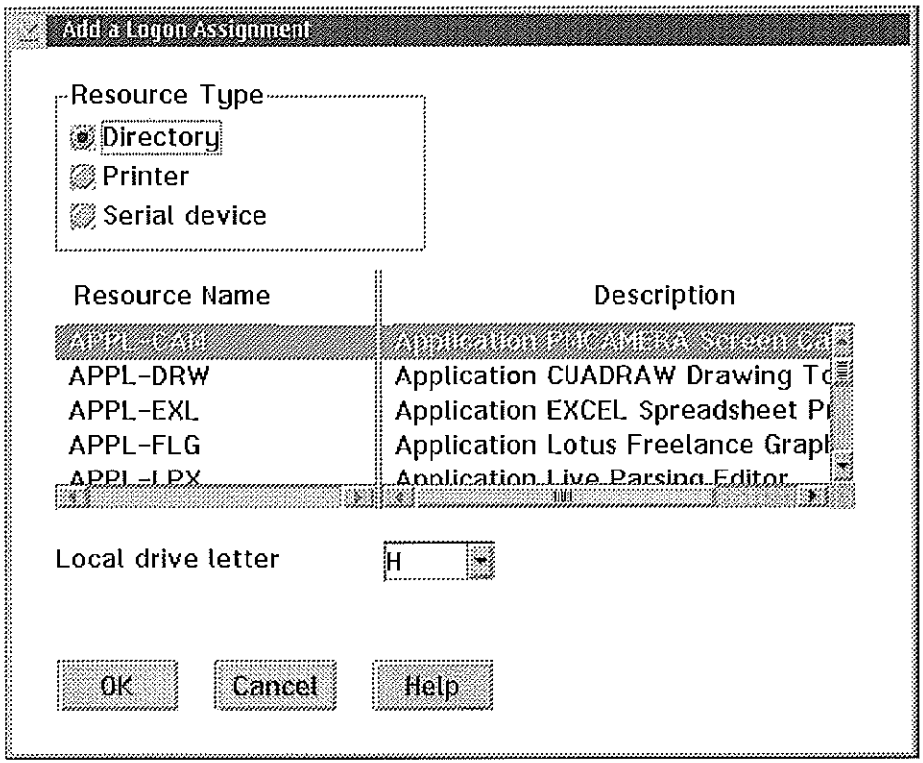


Figure 186. Network User Account Notebook - Adding Resources

The browse scope presented in this dialog covers *only* those resources from the domain to which you are currently logged on. You cannot connect to any resources on peer workstations, or on servers outside your current domain. To access such resources, you must use the File and Print Client Resource Browser.

Permanent Assignments

Logon assignments that you make from the Network User Account notebook will be permanent; they will appear each time you log on. If you no longer need a specific network resource, be sure to remove it from your assignment list. This will reduce network and server workload.

Note: The logon assignments and public applications shown in the notebook include those network resources to which you have been given automatic logon access by your network administrator. **Do not delete these resources, or you may get into trouble with your administrator!**

5.3.4.3 Automatic Connection during Logon

When setting up your user ID for access to a domain, your network administrator will often instruct the domain controller to automatically connect you to certain network resources whenever you log on to the domain. These resources will automatically be assigned local drive letters and port names, so you will not have to assign these names yourself.

This is the primary way that you can gain access to network applications. Such applications are defined for you by your network administrator, and appear in the Network Applications folder within the Connections folder on your desktop. This folder appears automatically after logon, if your administrator has set up network applications and granted you access to them.

Since you are connected automatically to these network resources during logon, it follows that you are automatically disconnected from them when you log off. You will lose your connection to any network drives and devices if you log off from the domain, and the Network Applications folder will disappear.

5.3.5 Disconnecting from Network Resources

After you have finished using a shared resource, you may want to disconnect from it. Disconnecting frees network resources in your computer and at the server. For resources that allow access only for a limited number of users, disconnecting can allow other users on the network to connect to the resource.

You can disconnect from a network resource using the same methods as you used to connect to the resource:

- Using the File and Print Client Resource Browser object, as described in 5.2.6, "Browsing Available Network Resources" on page 322.
- Use the Network User Account object, and select the **Remove** button on the Applications or Assignments tabs
- Using the NET USE command from the command line

Each of these methods will disconnect your OS/2 Warp 4 system from the resource. You will no longer have access to the resource, and the drive letter or port assigned to the resource will be available for reassignment.

5.3.6 Accessing Other Network Environments

Since you use the same components to access OS/2 Warp Server and Windows NT Server that you use to access computers running peer services or MS Windows for Workgroups, it follows that you can access resources on all these types of systems at the same time. The following sections will describe some special considerations that you should bear in mind when accessing different network environments.

5.3.6.1 Interoperability with MS Windows for Workgroups

Using the File and Print Client Resource Browser, you can view and access network resources on MS Windows for Workgroups systems. Note, however, that only drives and printers with no password or with a previously established connection will be visible and accessible. The File and Print Client Resource Browser will not display resources that are password-protected.

Connecting to Resources on MS Windows for Workgroups Systems: You can access network resources on systems running MS Windows for Workgroups, using OS/2 Warp 4's Peer Services component. OS/2 Warp 4 allows you to connect to such resources using the Shared Resources and Network Connections notebook (see 5.5, "Peer Networking" on page 382) or from the command line.

You can use the File and Print Client Resource Browser to browse network resources on MS Windows for Workgroups workstations, provided the workgroup names of the MS Windows for Workgroups workstations are within your browse scope. The default browse scope consists of your logon domain, the default domain as defined by the `Domain=` statement in the IBMLAN.INI file, and any other domains that you explicitly specify. There are two ways that you can specify additional domains:

- Issue the command NET CONFIG REQ /OTH:<*domains*> to specify up to four domains. Note that using this command will increase your browse scope *only* while you remain logged on; the additional domains will *not* appear the next time you log on.
- Add up to four domain names to the `othdomains=` statement in the requester section of the IBMLAN.INI file. This method will permanently increase your browse scope.

If you are connecting from your OS/2 Warp 4 system to an MS Windows for Workgroups resource that contains a blank character in the resource name (that is, the share name as defined on the MS Windows for Workgroups system), put the name containing the blank character in a string delimited with double quotation marks on the command line. For example:

```
NET USE d: "\\wfw lan\Ron 4D19"
```

Although user IDs and passwords are required for local area network access in MS Windows for Workgroups, share-level security has been implemented for shared resources. That is, each resource is shared simply with an optional password. If your logon password matches the password for that resource, MS Windows for Workgroups will allow you to access the resource from your OS/2 Warp 4 system. If your password does not match that of the resource, you can specify the correct resource password at the time you connect; OS/2 Warp 4 will prompt you for the password if required.

You can view only those directory and file properties for MS Windows for Workgroups files and directories that appear in the File page in each resource's entry in the File and Print Client Resource Browser. You can set the file attributes for archive, hidden, or read-only status.

If you want to use a printer attached to an MS Windows for Workgroups system, you must install the OS/2 Warp 4 printer driver for that printer on your OS/2 Warp 4 system, and associate it with the remote MS Windows for Workgroups printer. You can do this through the File and Print Client Resource Browser or through the Network Printer template. You can then view the printer queue on the MS Windows for Workgroups system, and manage your jobs by holding, releasing or deleting them. However, jobs cannot be copied or moved within the queue, and the job properties page is not accessible.

Connecting from MS Windows for Workgroups to Resources on OS/2 Warp 4 Systems: MS Windows for Workgroups workstations can access resources shared by OS/2 Warp 4 systems, except for serial devices (that is, comms ports). MS Windows for Workgroups workstations can browse the resources on OS/2 Warp 4 systems in a peer network or IBM Warp Server domain, provided at least one MS Windows for Workgroups or Microsoft Windows NT workstation is present in the same domain. Shared drives on OS/2 Warp 4 systems are visible in and accessible through the MS Windows for Workgroups File Manager. Shared printers on OS/2 Warp 4 systems are visible in and accessible through the MS Windows for Workgroups Print Manager.

Users on MS Windows for Workgroups systems can use their user ID and password to access shared resources on your OS/2 Warp 4 system. Users on MS Windows for Workgroups systems must synchronize their passwords with the required passwords on your OS/2 Warp 4 system. For help on how to do this, MS Windows for Workgroups users should type `NET HELP PASSWORD` on the MS Windows for Workgroups command line to see the command syntax.

OS/2 Warp 4 implements user-level security for access to shared resources. You can define user IDs, shared resources and access profiles. This is a somewhat more comprehensive approach than that taken by MS Windows for Workgroups, since you can selectively limit specific users to access only certain resources.

MS Windows for Workgroups is limited to DOS-compatible file names, and does not support OS/2 Warp 4's extended attributes such as creation date, last revision date, author, file description, and icon associations. Extended attributes can contain other application-specific data. If you attempt to move or copy a file to a network drive that does not support extended attributes, OS/2 Warp 4 will warn you that the extended attributes will be lost. If you wish, you can suppress this warning message by inserting a SET CONFIRMLOSTEAS=NO statement in your OS/2 Warp 4 CONFIG.SYS file. Most other application warning messages can be suppressed using digit position 41 of the `wrkheuristics` parameter in the IBMLAN.INI file.

To access a shared printer on an OS/2 Warp 4 system, an MS Windows for Workgroups user must install a matching printer driver on the MS Windows for Workgroups workstation and associate it with the printer on the OS/2 Warp 4 system. Each user can then manage jobs in the remote queue by pausing, resuming or deleting them. The user cannot change the position of print jobs in the queue.

Limitations: MS Windows for Workgroups 3.11 includes a messaging utility called WinPopup, which is interoperable with the OS/2 Warp 4 Network Messaging utility. However, the MS Windows for Workgroups ClipBook Viewer is not interoperable with OS/2 Warp 4's Network DDE and Clipboard utility.

Remote administration tools are not interoperable between OS/2 Warp 4 and MS Windows for Workgroups systems. That is, you cannot remotely administer an MS Windows for Workgroups system from an OS/2 Warp 4 system, or vice versa.

5.3.6.2 Interoperability with Microsoft Windows NT Server

OS/2 Warp 4 systems can access resources shared by Microsoft Windows NT Server. Connections to NT resources can be made through the Shared Resources and Network Connections notebook or from a command line with the NET USE command. Your access to NT resources is based on your user ID and password, and allows you to browse and use shared drives and printers exactly as you would use resources on an IBM Warp Server system.

Microsoft Windows NT users can browse the shared resources on a LAN Server domain, including OS/2 Warp 4 systems running Peer Services, provided that the workgroup name of at least one Microsoft Windows NT workstation or Microsoft Windows NT Server matches the domain name. Microsoft Windows NT Servers or workstations can access resources shared by OS/2 Warp 4 systems running Peer Services, except for serial devices. OS/2 Warp 4 shared drives will be visible in the Windows NT File Manager. Windows NT can use long file names and extended attributes.

To access a shared printer on an OS/2 Warp 4 system, the OS/2 Warp 4 workstation name and share name (\\workstation\sharename) must be entered on the Windows NT Print Manager command line before its printer resources will be visible to the Windows NT workstation. The user must install a Windows NT printer driver on the Windows NT system and associate it with the remote printer on the OS/2 Warp 4 system.

Both Microsoft Windows NT Workstation and Microsoft Windows NT Server and OS/2 Warp 4 Peer Services implement user-level security through user IDs and passwords. Each user manages his/her password on remote systems to maintain security. Peer Services users can manage their user password on the remote NT system through OS/2 Peer User Profile Management or the command line.

Microsoft Windows NT and OS/2 Warp 4 do not recognize each others' printer drivers. If you want to access a shared printer on a Windows NT system, you must install a OS/2 Warp 4 printer driver for that printer on your OS/2 Warp 4 system, and associate it with the printer on the Windows NT system. This can be done through the File and Print Client Resource Browser or the Network Printer template. You can then send jobs to the remote printer, and view or manipulate the queue. Print jobs originating from OS/2 Warp 4 or MS Windows for Workgroups systems are marked "remote down level documents" by the Windows NT system.

Note that remote administration tools are not interoperable between OS/2 Warp 4 and Windows NT. You cannot remotely administer a Microsoft Windows NT Server workstation from an OS/2 Warp 4 system, or vice versa.

5.4 Accessing Novell NetWare Servers

OS/2 Warp 4 allows you to access network resources on servers running the Novell NetWare network operating system. Since OS/2 Warp 4 allows you to connect to different types of servers at the same time, you can connect to NetWare servers and access their resources at the same time you are connecting to other types of servers and accessing their resources too.

The component of OS/2 Warp 4 that lets you connect to NetWare servers is called the Novell NetWare Client. The Novell NetWare Client allows you to connect to both NetWare 3.x and 4.x servers, and also includes support for Novell's SFTIII fault-tolerance software.

You can access resources on NetWare servers from the Workplace Shell, and also from within OS/2, DOS and Windows applications running on your OS/2 Warp 4 system.

5.4.1 Configuring Your NetWare Requester

You will normally install and configure the Novell NetWare Client when you install OS/2 Warp 4. You can also use the Selective Install for Networking utility to install the Novell NetWare Client after OS/2 Warp 4 installation if you wish. See 5.1, "Installing OS/2 Warp 4 Network Components" on page 262 and 5.8.5, "Novell NetWare Client" on page 472 for more information on installing the Novell NetWare Client. After the installation of the Novell NetWare Client on your computer, you will need to provide some additional configuration information so that the Novell NetWare Client can find your servers, and work correctly with other networking components of OS/2 Warp 4.

5.4.1.1 Setting Your Preferred Servers and Drives

The Novell NetWare Client needs to know several things about your network in order to correctly connect you to the right server. You typically supply these settings during installation, and the information is then stored in a file named NET.CFG. This file normally resides in the root directory of the drive where the Novell NetWare Client is installed.

You can edit the information in NET.CFG using the NetWare Installation utility in the Install/Remove folder within the System Setup folder.

The NetWare Installation utility will display a window as shown in Figure 187 on page 356.

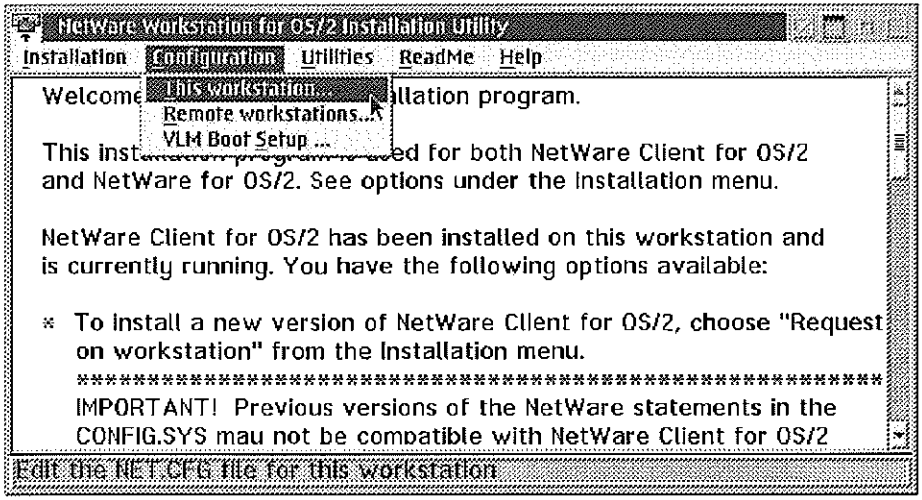


Figure 187. Configuring the NetWare Requester - Installation Utility

To edit NET.CFG and configure the Novell NetWare Client for your computer, select **Configuration** from the menu bar, and select **This workstation** from the resulting pull-down menu. The NetWare Installation utility will then display a window like that shown in Figure 188 on page 357.

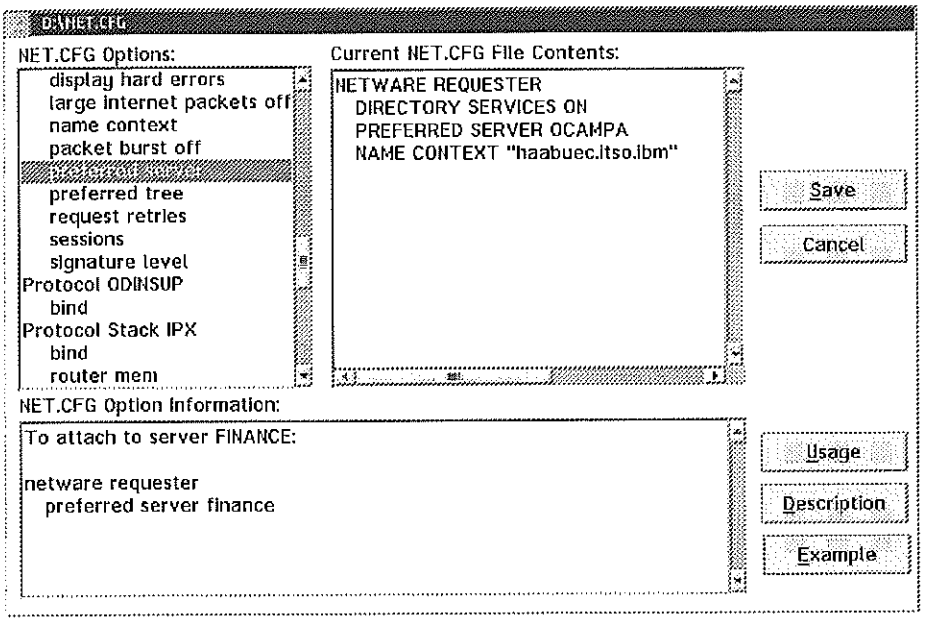


Figure 188. Configuring the NetWare Requester - Editing NET.CFG

Select **Preferred Server** by double-clicking your mouse on it. The current settings for this option will be shown on the right, along with a number of related options.

Setting Your Preferred Server: In the multiline entry field on the right, change the name that appears after the PREFERRED SERVER keyword to match the name of the server to which you want to connect. The Novell NetWare Client needs this information so that it will know which server you want to access. If you do not know the name of this server, ask your network administrator.

Setting Your Default Login Drive: When you first start the Novell NetWare Client, it automatically creates one network connection for you. This connection is for the default login drive on the server that you specify with the PREFERRED SERVER keyword. The Novell NetWare Client maintains this connection until you log in, and then disconnects you from the default login drive since you do not need it any more.

Note

While most servers such as IBM OS/2 Warp Server and Microsoft Windows NT Server use the term *logon* when referring to the process of identifying yourself to the server, Novell NetWare uses the term *login* instead. In this chapter, we will use the term *login*, since this is consistent with the information given in the online documentation for the Novell NetWare Client, and with Novell's own NetWare server documentation.

By default, the Novell NetWare Client accesses this directory as logical drive L: on your system. In most cases this is perfectly satisfactory, and you can leave the drive letter as it is.

However, if you are accessing different types of servers such as OS/2 Warp Server or Windows NT Server, you might have another network connection set up that already uses logical drive L: on your system. In this case, you will need to change the drive letter for the Novell NetWare Client's default login drive, since you cannot have two resources with the same drive letter.

To change your default login drive from drive L: to another drive, change the drive letter that appears after the `DEFAULT LOGIN DRIVE` keyword, as shown below:

```
NETWARE REQUESTER
    PREFERRED SERVER <server name>
    DEFAULT LOGIN DRIVE <n>
```

If you change the default login drive, you must edit your CONFIG.SYS file, so that any references in the LIBPATH, DPATH, and PATH statements that point to `L:\OS2` are changed to point to the new drive letter that you select.

5.4.1.2 Using OS/2 Warp 4 with NetWare Directory Services

Novell NetWare 4.x provides a feature known as *NetWare Directory Services* (**NDS**), which allows you to access resources on more than one NetWare server at the same time. While you still log in to only one server, NDS allows that server to "vouch for you" to other servers on the network, who can authorize you to access their resources. A group of servers and their resources that cooperate in this way is known as a *directory tree*.

For information on upgrading from NetWare 2.X and 3.X to 4.X, click on **Connections=> Network=> Network Services=> NetWare Services=> NetWare Client**.

Setting Your Preferred Tree: If your network has more than one directory tree, you must specify the tree to which you want to connect, using the `PREFERRED TREE` keyword in NET.CFG. If you have also specified a preferred server in your NET.CFG file, then the Novell NetWare Client first searches for the preferred tree, and then for the preferred server within that tree.

The PREFERRED TREE keyword is similar to the one shown below:

```
NETWARE REQUESTER
        :
   PREFERRED TREE <treename>
```

Replace the default setting (if any) with the name of your preferred tree.

Setting Your Name Context: Depending on where your preferred server lies within a directory tree, you may need to specify a name context to tell the NetWare server where to perform the login. Using a name context allows you to simply enter your user ID when you log in, rather than specifying the full context of your user ID each time.

Enter a NAME CONTEXT statement in your NET.CFG file, as shown in the example below:

```
NETWARE REQUESTER
        :
   NAME CONTEXT = "OU=OS2.OU=ITSC.O=IBM"
```

Note: You may omit the OU= and O=, for example:

```
NETWARE REQUESTER
        :
   NAME CONTEXT = "OS2.ITSC.IBM"
```

If you do not specify a name context in your NET.CFG file, you will need to enter a context whenever you log in. The login utility uses this context to find your user ID and connect you to the network. Without the name context, the login utility must search for your user object from the root of the tree. If more than one user exists with the same name (this is possible if you have different servers in the tree), the login utility may not locate the correct user ID unless you provide a context statement.

For example, without the name context statement in the NET.CFG, you must type `login userid.os2.itsc.ibm`. If you include it in the NET.CFG, you only need to type `login userid`.

5.4.2 Logging in to a NetWare Server

Before you can access network resources on NetWare servers, you must identify yourself to the server by logging in. The server then checks your user ID and password, and connects you to the resources for which your network administrator has granted you access.

You can log in from the Workplace Shell desktop or from the command line. You can then access resources using any Workplace Shell or command line session.

5.4.2.1 Using the Workplace Shell

You can log in to a NetWare server using the NetWare Browser, which is located in the Network folder within the Connections folder on your desktop. For detailed information on how to use the network browsers, see 5.2, "Local Area Network (LAN)" on page 305.

When you install the Novell NetWare Client, the installation procedure does not automatically create an icon for the Login utility. If you wish, you can create an icon for this utility, as follows:

1. Open the Templates folder on your desktop, find the Program template, and drag it to the location where you want the Login icon to reside.
2. The template will automatically open a Properties notebook. In the Path and file name field on the Program page of the notebook, type C:\NETWARE\LOGIN.EXE.

   Note that this assumes you installed the Novell NetWare Client using the default drive and directory names. If you used a different drive or directory, enter the correct path to the LOGIN.EXE program.
3. If you wish, you can enter your server name and user ID in the Parameters field.
4. Go to the General page by clicking on its tab in the notebook, and change the Title field to NetWare Login.
5. Close the Properties notebook by double-clicking your mouse on the icon in the top left-hand corner.

You can now log in to your NetWare server by double-clicking on the **NetWare Login** icon.

5.4.2.2 Using the Command Line

You can log in from a command line session, using the LOGIN command as shown below:

```
LOGIN <server>\<user>
```

where <server> and <user> are replaced by the name of your login server and your user ID. Note that if you specified a preferred login server in your NET.CFG file, you do not need to type a server name, and the LOGIN command will look like this:

```
LOGIN <user>
```

When you log in from a command line session, you can access network resources from *all* sessions and applications in your OS/2 Warp 4 system.

For details on logging into a NetWare 4.X Directory Tree, see 5.4.1.2, "Using OS/2 Warp 4 with NetWare Directory Services" on page 358.

5.4.2.3 Automating the Login Process

You can start the Novell NetWare Client and log in automatically when you boot your OS/2 Warp 4 system. There are two methods that allow you to this:

- You can use the NetWare Tools utility, along with OS/2 Warp 4's STARTUP.CMD file
- You can add the appropriate statements to your OS/2 Warp 4 CONFIG.SYS file

Each of these methods is explained below.

Before you automate the login process, you should first log in and connect to all the resources that you will normally require (see 5.4.3, "Connecting to Network Resources" on page 362). You can then save these connections in a file, which you can use to automatically reestablish the connections whenever you log in.

Using NetWare Tools and STARTUP.CMD: Whenever you boot OS/2 Warp 4, the operating system searches for a file named STARTUP.CMD, which resides in the root directory of your boot drive. If the file is present, OS/2 Warp 4 runs the commands contained in the file before starting the Workplace Shell.

You can add the following statement to the STARTUP.CMD file to automatically start the Novell NetWare Client and log in:

```
NWTOOLS LOG.NWS AUTOEXIT
```

Note that LOG.NWS is the name of the file that saves any connections (mappings, capturing, etc.) using NetWare Tools (see 5.4.3.2, "Using the NetWare Tools Utility" on page 363 for more information). If the file name you use is different, you should use the path and file name that you entered when saving your connection information.

This statement will start the NetWare Tools utility, which will read the connection information contained in the specified file, establish the connections, and then exit. Since you have not logged in at this time, the NetWare Tools utility will automatically prompt you for your user ID and password.

Using CONFIG.SYS: You can automatically start the Novell NetWare Client and log in by adding the appropriate statements to your CONFIG.SYS file. To do this, add the following statements at the end of the CONFIG.SYS file:

```
CALL=C:\NETWARE\NWSTART
CALL=C:\NETWARE\LOGIN <server>\<user>
```

where <server> and <user> are replaced by the name of your login server and your user ID on that server.

Login Scripts: A login script is a file that the Novell NetWare Client accesses when you log in, to set up any special aspects of your NetWare environment, and map any network resources that have been defined for you at your server. Login scripts are normally set up by your network administrator.

Some of the commands available in a login script work differently under OS/2 Warp 4 than under DOS. The following commands have unique functions or limitations when used in OS/2 Warp 4 login scripts:

Command	Limitation
EXIT	Does not support the filename parameter.
DRIVE	Sets the default for the login process only.

INCLUDE — If you use an include statement, you must specify a Universal Naming Convention (UNC) pathname for the file to be included (for example, INCLUDE \\NW1\SYS\PUBLIC\TEST.TXT).

MAP — The Novell NetWare Client does not support map search drives. See "Drive Mappings in Global Sessions" on page 373 for further information.

SET — Sets the environment variable during the login process only. Spawned processes inherit any set variables, but the variable disappears when the LOGIN function terminates.

The following login script commands are not supported under OS/2 Warp 4:

- COMSPEC
- DOS BREAK
- MACHINE NAME

If you are logging in to a NetWare 3.x server, the default login script file for OS/2 Warp 4's Novell NetWare Client is located in SYS:PUBLIC\NET$LOG.OS2. This filename differs from the default login script used for DOS requesters (NET$LOG.DAT). If your network administrator has not already created this file, you can create it yourself - it is just an ASCII file. If you want to use the settings in NET$LOG.DAT file for the OS/2 workstations without copying the actual file into the NET$LOG.OS2 file, you can put the following line in the NET$LOG.OS2 file:

```
include sys:public\net$log.dat
```

When using NDS under NetWare 4.x, the container login script is used for both DOS and OS/2 Warp 4 users. Profile login scripts are typically used for OS/2 Warp 4 users.

Note that NetWare 4.x supports `if OS="OS2" then...else...end` statements in the container login script, enabling a network administrator to provide tailored login scripts for OS/2 Warp 4 or DOS users within a single file.

5.4.3 Connecting to Network Resources

After you have logged in to a NetWare server or directory tree, you will want to access the network resources that are located on that server or tree. From your OS/2 Warp 4 system, you can do this in a number of ways:

- You can use the Network folder on your desktop to browse the available servers and resources on your network, and connect to the ones you want.
- You can use the NetWare Tools utility to make and change your network connections.

Each of these methods allows you to connect to resources, change your connections or disconnect from any resource. Which method you choose is entirely up to you.

5.4.3.1 Using the Workplace Shell

You can use the resource browsers within the Network folder to access NetWare servers and resources. These browsers are described in detail in 5.2, "Local Area Network (LAN)" on page 305.

5.4.3.2 Using the NetWare Tools Utility

The NetWare Tools utility in the NetWare Services folder allows you to manage your connections to NetWare servers. Using this utility, you can:

- Manage connections to network drives and directories, and assign local drive letters to them
- Manage connections to network printers, and assign local port names to them
- Manage directory trees and bindery server connections for NetWare 4.x NDS networks
- Display the users on your network, and send messages to them

To start the NetWare Tools utility, click on the **NetWare Services** folder on your desktop, and double-click your left mouse button on the **NetWare Tools** icon. The NetWare Tools utility will display a window as shown in Figure 189.

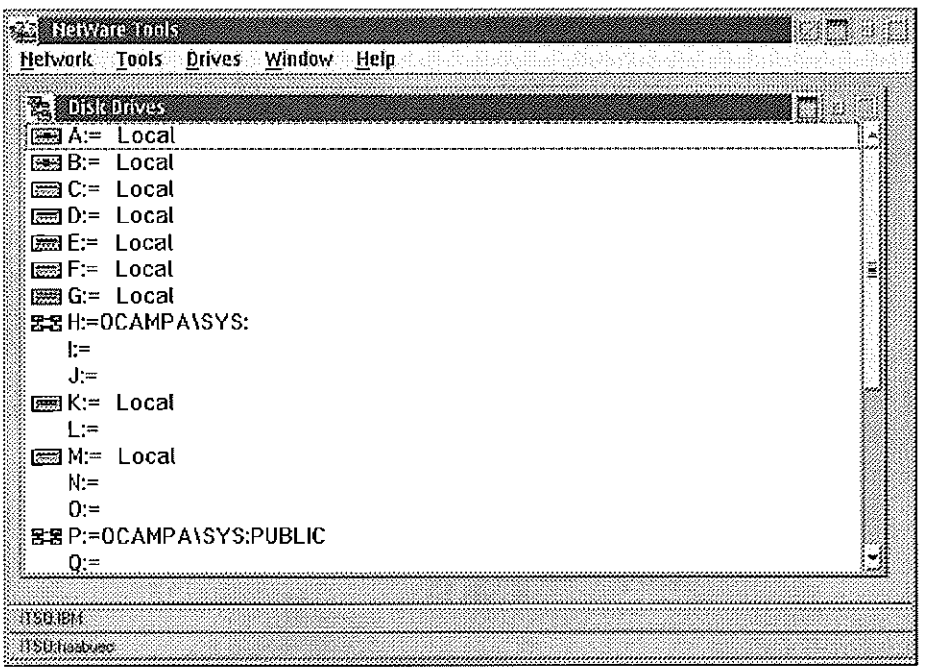


Figure 189. NetWare Tools Utility

When you first start the NetWare Tools utility, it displays a window showing your current local drive mappings. This is because drive mappings are the things that network users tend to change most often, so the utility saves you the trouble of selecting this option from the menu bar.

You can display other types of network resources by selecting the **Tools** item on the menu bar, then selecting the type of resource you wish to view from the resulting pull-down menu. The NetWare Tools utility will then display additional windows showing these resources.

Note that the menu bar in the NetWare Tools utility changes, depending on which of these windows currently has the focus. For example, when you select **Disk Drives**, you will see a Drives item in the menu bar, whereas if you select **Printer Ports**, the Drives item disappears and is replaced by a Printers item.

Connecting to Network Drives: Use the Drives item on the menu bar to map network resources in the directory tree and file system to local drive letters on your computer. Display the Disk Drives window by selecting **Tools** from the menu bar and **Disk Drives** from the resulting pull-down menu. Note that this window is displayed by default when you start the NetWare Tools utility.

The Disk Drives window shows all your logical drive letters, along with the network resources to which they are currently mapped. To connect to a new resource and map it to a logical drive letter, select the drive letter that you want to use by double-clicking on it in the window.

The NetWare Tools utility will display a window as shown in Figure 190 on page 365.

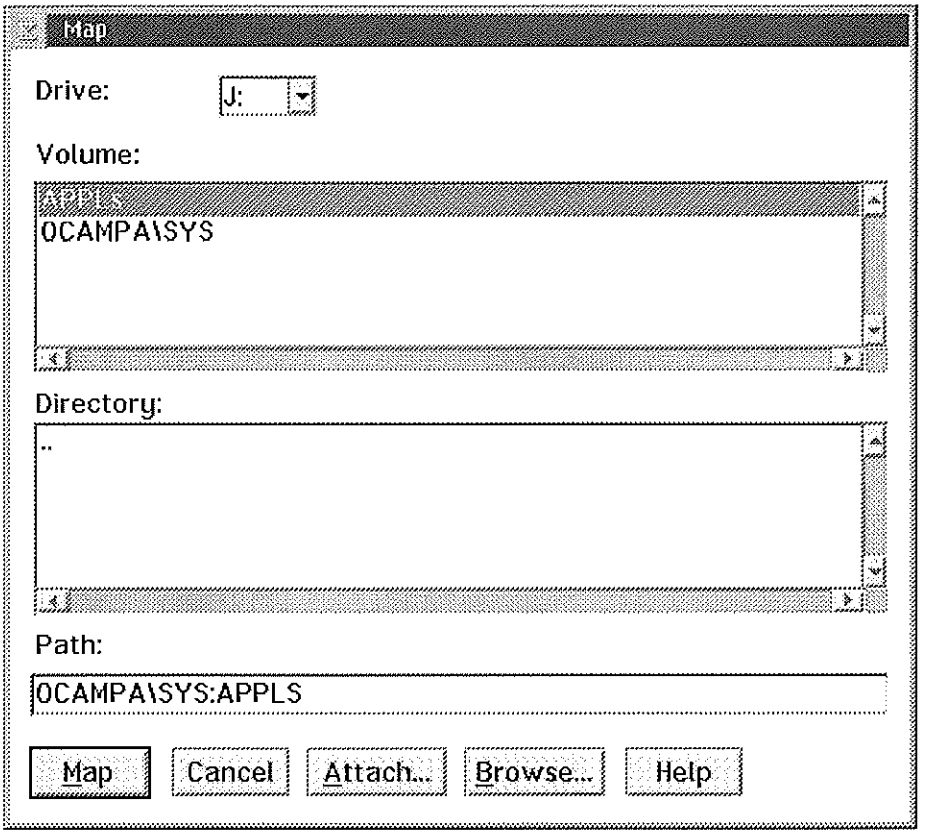


Figure 190. NetWare Tools - Mapping Network Drives

Select the resource you want from the Volume and Directory lists, then select the **Map** button at the bottom of the window. If you wish, you can simply enter the full name of the resource in the Path field.

If you are not already logged in to the server or directory tree that contains the resource you want, you can select the **Attach** button to perform this function from this point. Note, however, that this function does not run a login script, so you will not automatically map any network resources.

Any mappings you create using the NetWare Tools utility will appear in the Drives folder on your desktop as network drives. Similarly, any mappings that you make using the Network folder or the command line will be visible in the NetWare Tools utility's Disk Drives window.

Connecting to Network Printers: Use the **Printers** option on the menu bar to map network print queues to your workstation printing ports. This process is known as *capturing* the printer port.

Display the Printer Ports window by selecting the **Tools** item in the menu bar and selecting **Printer Ports** from the resulting pull-down menu. Next, choose the printer port you want to capture by double-clicking your left mouse button on it in the Printer Ports window. You then see a Capture window as shown in Figure 191.

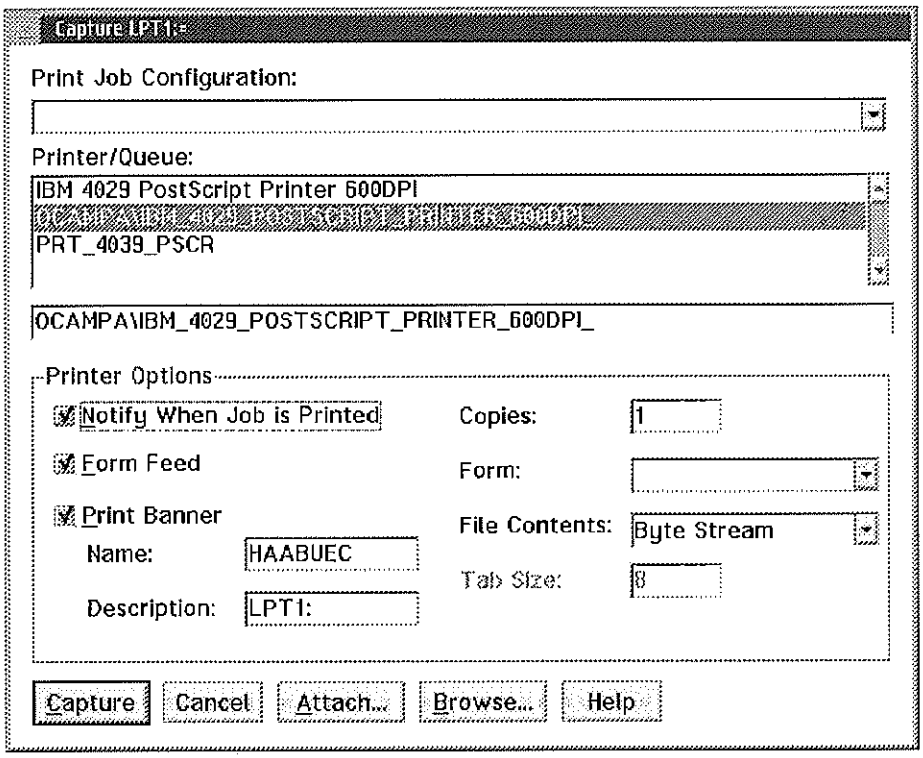


Figure 191. NetWare Tools - Mapping Network Printers

Select the printer port you want to capture in the Printer/Queue list. If you wish, you can enter the full name of the network printer resource in the Queue field.

If the resource that you want to capture does not appear in the Printer/Queue list, you may not be connected to the server or directory tree on which that resource resides. Click on the **Attach** button to connect to that server or directory tree and log in.

You can specify additional settings when you connect to a network printer, using the fields in the Capture window as follows:

Field	Function
Notify	Confirms print job completion
Formfeed	Places a page break between print jobs
Copies	Specifies the number of copies to print
Tabs Size	Specifies the number of characters in a tab stop
File Contents	Specifies the type of print file being printed
Print Banner	Allows for a banner page to be printed at the front of your print job
Form	Allows you to select a defined print form

When you have specified all the options you want, select the **Capture** button to capture the printer port and make the connection.

Changing Your Directory Tree: When connecting to NetWare 4.x servers running NDS, the Tree option. Display the Tree window by selecting **Tools** from the menu bar, then selecting **Directory Tree** from the resulting pull-down menu. The NetWare Tools utility will display a Directory Tree window, as shown in Figure 192.

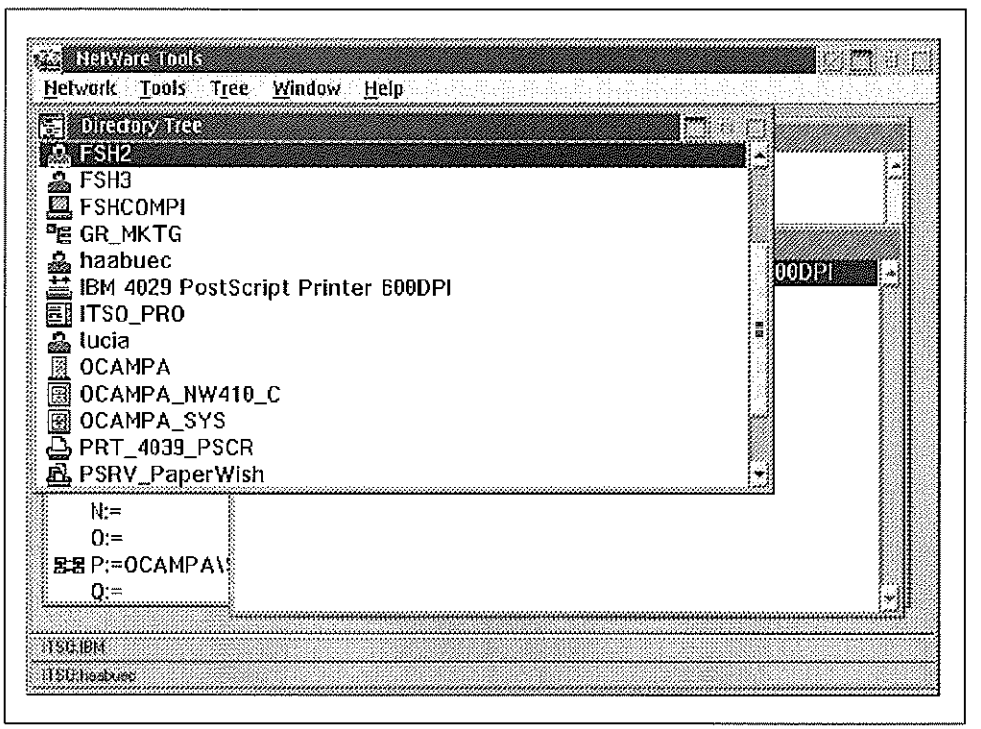


Figure 192. NetWare Tools - Changing Directory Trees

You can select a tree from the list displayed by double-clicking your mouse on it in the Directory Tree window. You can then connect and log in to that directory tree.

Click on **Tree** on the menu bar in the the Directory Tree window to change your directory tree, log in, or change your name context. You can use the Tree pull-down menu to perform any of these functions from within the NetWare Tools utility.

When you log in to a directory tree using the NetWare Tools utility, the Novell NetWare Client does not run a login script for you, and no network resources are automatically mapped. Click on the **Save Settings** and **Load Settings** options in the Network pull-down menu to map your network resources (see 5.4.3.3, "Saving Your Connections" on page 370).

Note that the Directory Tree window and the Tree menu are applicable only to NetWare 4.x networks. If your servers are running NetWare 3.x, the Servers window and Servers menu provide equivalent functions. See "Changing Servers" for further information.

Changing Servers: You can use the Servers window to attach to bindery-based servers, as used by NetWare 2.x and 3.x networks. Display the Servers window by selecting **Tools** from the menu bar and selecting the **Servers** option from the resulting pull-down menu. The NetWare Tools utility will then display the Servers window as shown in Figure 193 on page 369.

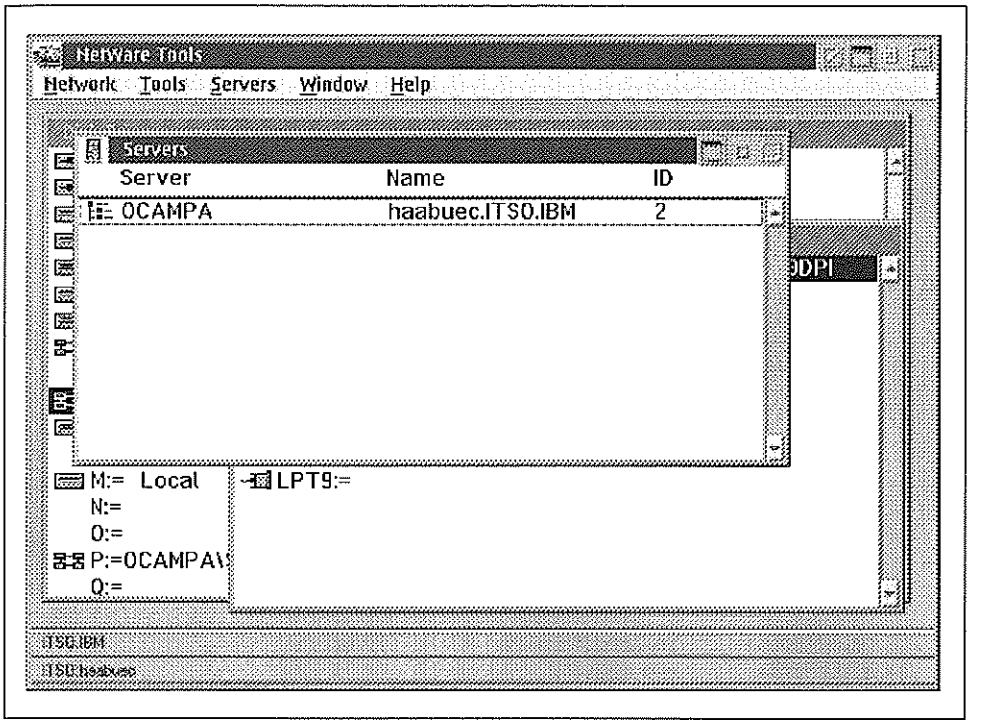


Figure 193. NetWare Tools - Changing Servers

Select the server you want from the list in the Servers window, then use the Servers item on the menu bar to attach to it. The resulting pull-down menu allows you to attach to a server, or to detach from a server to which you are currently attached.

If you do not see the server you want in the list displayed, try selecting the **List all** item from the Servers pull-down menu. This will ensure that the Servers window displays all the servers on your network.

When you log in to a server tree using the NetWare Tools utility, the Novell NetWare Client does not run a login script for you, and no network resources are automatically mapped. Click on the **Save Settings** and **Load Settings** options in the **Network** pull-down menu to map your network resources (see 5.4.3.3, "Saving Your Connections" on page 370).

Note that the Servers window and the Servers pull-down menu are applicable only to NetWare 2.x and 3.x servers. If you are running NetWare 4.x servers with NDS, the Directory Tree window and Tree menu provide equivalent function.

Sending Messages to Users: When you are attached and logged in to a directory tree or server, you can display network users and groups and send messages to them. Select **Tools** from the menu bar and then selecting **Users** from the resulting pull-down

menu. The **NetWare Tools** utility will display a Users window as shown in Figure 194 on page 370.

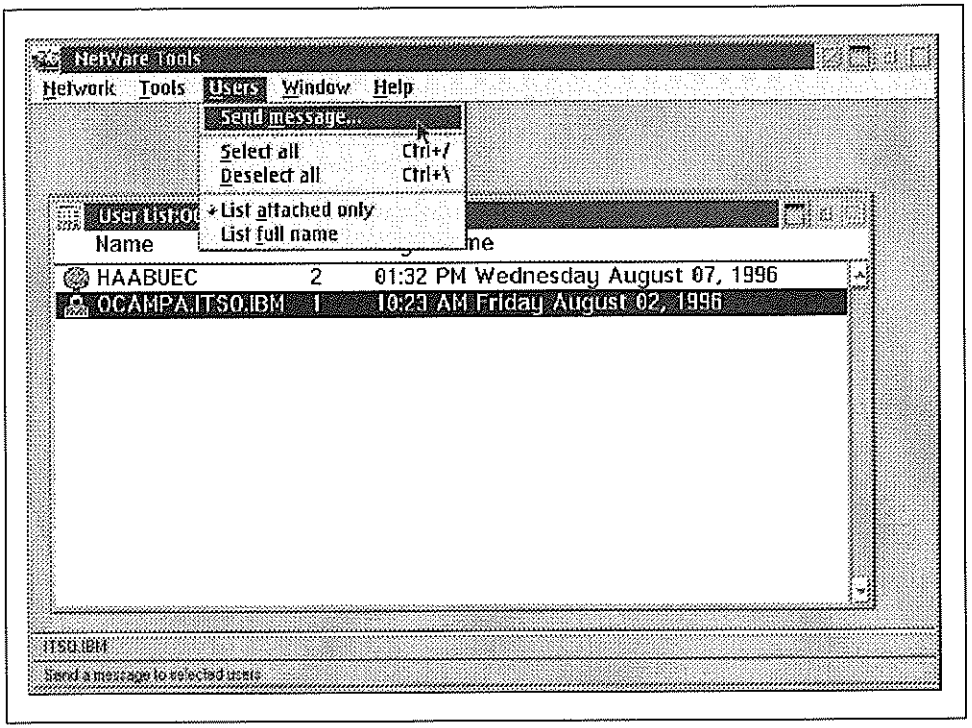


Figure 194. NetWare Tools Utility - Sending Messages

If you do not see the name of the user to whom you want to send a message, check to ensure that you are logged in to the same server or directory tree as that user. The Users window shows only the users for the server or directory tree on which you are currently logged in.

Select the user to whom you want to send a message, then select **Send Message** from the Users pull-down menu. Type your message in the Messages field, then choose the **Send** button at the bottom of the dialog to send the message.

5.4.3.3 Saving Your Connections

When you have set up your network connections and mapped your network resources in the way you want, you should save these settings to a file so that you can reconnect easily the next time you log in to the Novell NetWare Client.

To save your settings, select the **Network** option from the menu bar, then select **Save Settings** or **Save Settings As** from the resulting pull-down menu. The Save Settings option will save your settings in the file from which you previously loaded them,

overwriting any settings you already had in that file. The Save Settings As option allows you to modify your settings and then save them into a different file.

When you have saved your settings into a file, you can use that file to reload those settings again later, either clicking on the **Load Settings** item from the Network pull-down menu, or by running the NetWare Tools utility from the command line or your STARTUP.CMD file as described in 5.4.2.3, "Automating the Login Process" on page 360.

5.4.4 Running DOS and Windows Applications with NetWare

When you log in to a NetWare server from your OS/2 Warp 4 system, using the methods already described, you will normally have access to network resources from any session or application on your system, regardless of whether that application is an OS/2, DOS or Windows application.

However, you can set up your DOS and WIN-OS/2 sessions with different levels of Novell NetWare Client support if you wish. These levels, and their implications for networking applications, are discussed in the following sections.

5.4.4.1 Types of Session

From a virtual DOS or WIN-OS/2 session, you can have the following kinds of NetWare support:

- Global

  In this configuration, all DOS, WIN-OS/2, and OS/2 sessions configured for global login support share a single login to a NetWare server. Drives that are mapped in one session apply to the other sessions, and printer ports captured in one session are also captured in other sessions.

  This is the default configuration, and is best for the majority of uses since it minimizes the number of connections between your computer and the server.

- Private

  In this configuration, all DOS and WIN-OS/2 sessions configured for private login support must log in separately to a NetWare server. Drive mappings and port captures from one session do not apply to the other sessions.

  This configuration is useful where users need more than one connection to a server, or where users need logins from DOS or WIN-OS/2 sessions to be separate from logins from OS/2 sessions.

- No Login Support

  In this configuration, sessions that are configured with network support can run applications that use the IPX/SPX protocols, but cannot log in to a server or access network resources such as drive or printers.

- No Network Support

In this configuration, applications running in a session have no access to NetWare servers, cannot log in and access network resources, and cannot use NetWare protocols such as IPX.

5.4.4.2 Configuring Sessions

When you install the Novell NetWare Client, you select the default level of support that you want for DOS and WIN-OS/2 sessions. The installation procedure then configures the Novell NetWare Client for this level of support, adding lines to your CONFIG.SYS file to load the VIPX and VSHELL components, which then allow these sessions to use the Novell NetWare Client. Two new DOS settings, NETWARE_RESOURCES and VIPX_ENABLED, are also added to the DOS Settings notebook for all DOS and WIN-OS/2 sessions.

By default, the Novell NetWare Client sets all DOS and WIN-OS/2 sessions as global sessions. However, you can individually configure the level of support for each session:

- If you set NETWARE_RESOURCES to GLOBAL, IPX protocol support is loaded for every DOS or WIN-OS/2 session, and the NETX command is run to load the NetWare shell every time you start a session. This is the default option.
- If you set NETWARE_RESOURCES to PRIVATE, IPX protocol support is loaded, but the NetWare shell is not loaded. You can load it manually if you wish by entering the NETX command from within the session.
- If you set NETWARE_RESOURCES to NONE, you cannot log in to servers and access network resources from this session.
- If you set VIPX_ENABLED to OFF, then no NetWare support is loaded. You cannot log in to servers, access resources, or run applications that require NetWare protocol support.

You must set VIPX to ON if you set NETWARE_RESOURCES to GLOBAL or PRIVATE.

5.4.4.3 Logging in from DOS or WIN-OS/2 Sessions

OS/2 Warp 4's Novell NetWare Client also allows you to log in from within a DOS or WIN-OS/2 session. You can log in to a NetWare 2.x or 3.x server in this way, or to a NetWare 4.x server that supports bindery emulation. If you do not know whether your server supports bindery emulation, ask your network administrator.

To log in from a DOS or WIN-OS/2 session, you must load the NetWare shell program into that session using the command:

```
NETX
```

If you wish, you can add this command to your AUTOEXEC.BAT file so that the NetWare shell will automatically be loaded into any DOS or WIN-OS/2 session that you start.

When you have loaded the NetWare shell, you can log in using the following steps:

1. Switch to your default login drive. This is usually drive L: unless you have specified a different drive in your NET.CFG file.
2. Enter the LOGIN command, as described in 5.4.2, "Logging in to a NetWare Server" on page 359.

You are now logged in to your server. Within the DOS or WIN-OS/2 session, you get full network support, just as if you logged in from a DOS or Windows system. You can access network resources, and you can run applications that use the IPX, SPX, Named Pipes, and NetBIOS protocols.

Accessing the Correct Version of DOS: When you log in from a DOS session, you might find that you encounter errors such as "Incorrect Version of DOS." This is because NetWare login scripts for DOS may contain a `COMSPEC` statement that identifies the DOS command processor, and this statement may point to the wrong file if you are running OS/2 Warp 4's virtual DOS emulation.

If you use the version of DOS included with OS/2 Warp 4, edit the login script and change the `COMSPEC` statement to the following:

```
SET COMSPEC=<drive>:\OS2\MDOS\COMMAND.COM
```

where <drive> is the local drive on which you installed OS/2 Warp 4.

If you use another version of DOS to boot your DOS session under OS/2 Warp 4, you should set the COMSPEC statement to point to the command processor for that version.

Drive Mappings in Global Sessions: Drive mappings in DOS differ from drive mappings in OS/2. In OS/2, all mapped network drives function as root drives. Therefore, drives mapped in OS/2 sessions show up as root drives in global DOS sessions, since these sessions use the standard OS/2 resource mappings. Similarly, drives mapped in global DOS sessions show up as root drives in OS/2 sessions.

Search drive mappings are not used in OS/2. Therefore, search drives mapped in global DOS sessions are ignored in OS/2 sessions. Also, any search drives mapped in one global DOS session do not apply to other global DOS sessions. To eliminate confusion, we recommend that you avoid using search drives in a global environment. Instead, set up your global DOS session environment as outlined in the following procedure:

1. Decide which drives you want mapped in your global environment. Decide which of those drives need to be included in a search path.
2. Edit your NetWare 4.x login script (used in OS/2 sessions) and include `MAP` statements for all NetWare drives.
3. Edit your NetWare 3.x DOS login script and include `MAP ROOT` statements for all NetWare drives.

   To edit your NetWare 3.x DOS login script, use a text editor to edit the SYS:MAIL*userID*\LOGIN file or use a NetWare 3.x utility such as SYSCON.

Use MAP ROOT rather than MAP for consistency between DOS and OS/2 sessions. For easiest maintenance, both login scripts should contain identical map statements.

4. Edit your OS/2 CONFIG.SYS file and include the drive letters you want to be searchable in your PATH statement.

   This path is where OS/2 searches for .EXE, .CMD, and .COM files. For example, to include drive H: in the search path, add the following to your path:

   ```
   H:\;
   ```

   If you need OS/2 to search for data files in this path, add this also to the DPATH statement in CONFIG.SYS.

   If you need OS/2 to search for DLLs in this path, add this also to the LIBPATH statement in CONFIG.SYS.

5. Edit your AUTOEXEC.BAT file and include a path to the same drives you included in CONFIG.SYS.

   This path is where DOS searches for files. For example, to include drive H: in the search path, add the following to the `SET PATH` statement in your AUTOEXEC.BAT file:

   ```
   PATH C:\OS2;C:\OS2\MDOS;C:\OS2\MDOS\WINOS2;h:\;
   ```

   `SET PATH` statements are limited to 123 characters, so try to map drives to the exact directories you need and minimize the number of subdirectories you specify.

For more information about PATH and DPATH settings or parameters, see the online *Command Reference*.

Drive Mappings in Private Sessions: Drive mappings in private sessions are the same as for native DOS requesters. You can use search drive mappings, but no drives mapped in one private DOS session will apply to any other private or global DOS sessions.

Make sure that your login script is pointing to the correct version of DOS for the session you are starting. See "Accessing the Correct Version of DOS" on page 373 for more details.

5.4.4.4 Disabling Network Support in All Virtual Sessions

To disable all network support in DOS and WIN-OS/2 sessions, run the Novell NetWare Client Installation program, and deselect **Support for DOS and Windows Sessions**. This will remove the VIPX and VSHELL statements from your CONFIG.SYS file. Then reboot your computer.

5.4.5 Administering Servers

As regards NetWare 2.X and 3.X bindery servers, OS/2 Warp 4's Novell NetWare Client will allow the use of various administration tools. In fact, there are many OS/2 native administration utilities available in the SYS:PUBLIC\OS2 directory on the server equivalent to the DOS ones in SYS:PUBLIC. This includes an OS/2 version of SYSCON, the main administration tool. You can still use the DOS-based utilities in SYS:PUBLIC under OS/2 but be aware that settings made in the DOS-based utilities may not be reflected in the OS/2 version.

As regards NetWare 4.X NDS, OS/2 Warp 4's Novell NetWare Client does not provide an OS/2-based utility to administer the network. For example, there is not an OS/2 native version of the NetWare Administrator. However, you can still use the DOS-based utilities in SYS:PUBLIC and the OS/2 utilities in SYS:PUBLIC\OS2.

There is also a special VLMBOOT diskette that you can use to create a private session with full support for administering servers including the NetWare Administrator. VLMBOOT creates a DOS private session that loads another version of DOS using NetWare Client for DOS.

To set up the VLMBOOT feature, you must follow these steps:

1. Create the VLMBOOT diskette.

   From the OS/2 command prompt type:

   ```
   d:\IMAGES\LOADDSKF d:\IMAGES\NETWARE\VLMBOOT.DSK
   ```

   where `d:` is the drive letter that corresponds to your CD-ROM drive.

2. Start the Novell NetWare Client Installation utility by selecting the **Installation** icon in the Novell folder.
3. Select **Configuration** and **VLM Boot Setup**, as shown in Figure 195 on page 376.

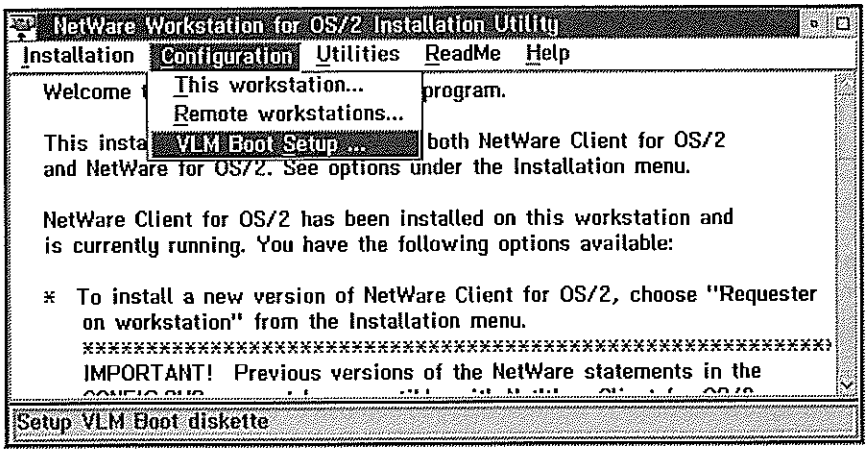


Figure 195. VLM Boot Setup

4. Insert the VLMBOOT diskette created in step 1 into your diskette drive, and select the **OK** button to modify the diskette's CONFIG.SYS and AUTOEXEC.BAT files to customize it for your installation environment.

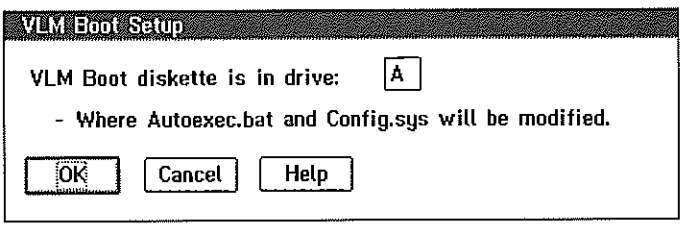


Figure 196. VLMBOOT Setup - Modifying Diskette Files

5. If your OS/2 hard disk is formatted for HPFS, do the following:
   a. Copy \OS2\MDOS\FSFILTER.SYS to the VLMBOOT diskette.
   b. Edit the diskette CONFIG.SYS, and add the following statement:

      ```
      DEVICE=FSFILTER.SYS
      ```

   c. Select **OK** to create the VLMBOOT image.
   d. Start the VLMBOOT session by clicking on the VL**MBOOT** icon on the desktop.

The Create VLMBOOT process does the following things:

- Changes the AUTOEXEC.BAT and CONFIG.SYS files on the VLMBOOT diskette to have the correct paths to OS/2 Warp 4's directories

- Changes the AUTOEXEC.BAT file to add NETWARE\NETXDLL to the search path
- Moves NETWARE.DRV and NETWARE.HLP from \OS2\MDOS\WINOS2\SYSTEM to \NETWARE\NETXDLL
- Adds `NETWORK.DRV=NETWARE.DRV` and `NETWORK.DRV=Novell Network` to SYSTEM.INI
- Creates a boot image in the \NETWARE\VLMBOOT directory
- Creates an icon for VLMBOOT on your desktop

5.4.6 Running NetBIOS over IPX

There are two types of NetBIOS protocol support that you can run using OS/2 Warp 4:

- OS/2 Warp 4's own NetBIOS is implemented by the MPTS component of OS/2 Warp 4, and allows you to connect to other machines running OS/2 Warp 4, Windows for Workgroups, OS/2 Warp Server or Windows NT Server. See 5.8, "Multiple Protocol Transport Services" on page 443 for more detailed information on MPTS.
- Novell's NetBIOS is implemented within the Novell NetWare Client itself, and differs from that implemented in MPTS. This is required because NetWare servers use a different implementation of the NetBIOS protocol, and you need a special NetBIOS on your computer to talk to NetWare servers using NetBIOS

The MPTS NetBIOS and the NetWare NetBIOS emulation can coexist on your machine. You must configure NetWare's NetBIOS emulation if you have an application that uses NetBIOS and is located on a server running IPX. An application or computer using the NetWare NetBIOS cannot communicate with another application using the MPTS NetBIOS.

If you install the Novell NetWare Client when you install OS/2 Warp 4, you do not get an option to configure NetWare NetBIOS emulation at installation time. OS/2 Warp 4 automatically assumes that if you have chosen to install the Novell NetWare Client and either peer services or the requester service, then these services will use the NetBIOS protocol and the Novell NetWare Client will use IPX. OS/2 Warp 4 therefore configures your computer to run multiple network protocols.

In some circumstances, it is advantageous to run only a single network protocol. Having a single protocol makes it easier to manage and control network traffic on large networks. OS/2 Warp 4 allows you to run NetBIOS applications such as peer services and the requester service on a network using the IPX protocol, by emulating the NetBIOS protocol over IPX.

5.4.6.1 Configuring NetWare for NetBIOS Emulation

To set up NetBIOS emulation within the Novell NetWare Client, you must change the Novell NetWare Client's configuration to use the NetWare NetBIOS emulation, as follows:

1. Start the Install utility from the Novell folder.

2. Select **Installation** from the menu bar and select **Requester on workstation** from the resulting pull-down menu. The Install utility will display a window as shown in Figure 197 on page 378.

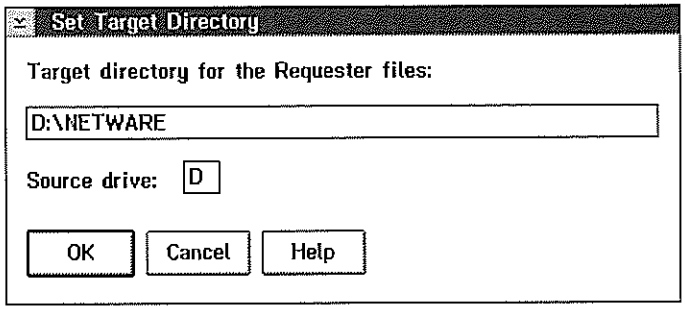


Figure 197. Configuring NetBIOS Emulation - Target Directory

3. Leave the Target directory for the Requester files and Source drive fields at the defaults, since you are reconfiguring your existing installation, and select the **OK** button.
4. The Install utility will now display the Requester Installation window. Select **Only Edit CONFIG.SYS** and select the **OK** button.
5. The Install utility will ask whether you want to update the installed LAN driver. Select the check box to *not* update the currently installed LAN driver.
6. Accept the default values on the following windows until you see the Optional Protocols window.
7. Select the **NetBIOS Emulation for OS/2 Sessions** check box, as shown in Figure 198 on page 379.

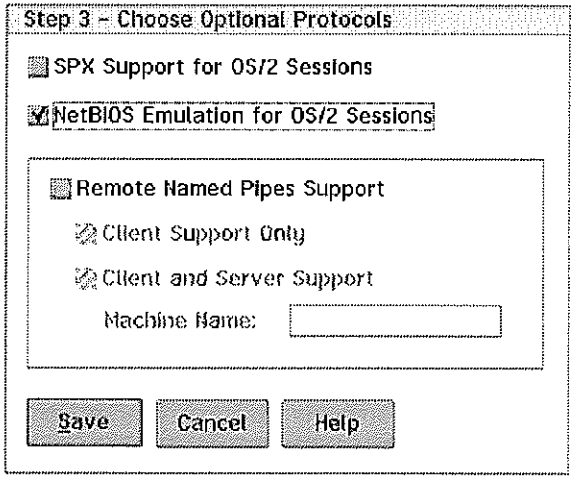


Figure 198. Configuring NetBIOS Emulation - Optional Protocols

8. Select the **Save** button to save your choices.
9. Go to a command line and run the NWFIXUP utility.

   The Novell NetWare Client does not correctly update your CONFIG.SYS file to use the ODI2NDI driver. Running the NWFIXUP utility after any Novell NetWare Client configuration correctly saves the change in CONFIG.SYS.

5.4.6.2 Configuring NetBIOS Parameters

It is possible that you will need to change the default values for certain NetBIOS parameters if you are running multiple applications using NetBIOS protocols, to ensure that each application has access to sufficient network buffers and internal control blocks to run successfully.

The following NetWare NetBIOS emulation parameters determine the NetBIOS resources that are available for NetBIOS applications running over NetWare NetBIOS emulation:

- `COMMANDS`

  This corresponds with the `NCBS` parameter in the NETBEUI_NIF section of the PROTOCOL.INI file. The default value is 32.

- `SESSIONS`

  This corresponds with the `SESSIONS` parameter in the NETBEUI_NIF section of the PROTOCOL.INI file. The default value is 16.

- `NAMES`

This corresponds with the NAMES parameter in the NETBEUI_NIF section of the PROTOCOL.INI file. The default value is 24.

If the default values for COMMANDS, SESSIONS, and NAMES are adequate, you may not need to configure the NET.CFG file.

If you do need the change the values of these parameters, follow these steps:

1. Start the Install utility from the Novell folder on your desktop.
2. Select **Configuration** and **This workstation** (accept the default path for the NET.CFG file).
3. Select **Edit**. The panel in Figure 199 is displayed.
4. Select **NetWare NetBIOS** from the list on the left.

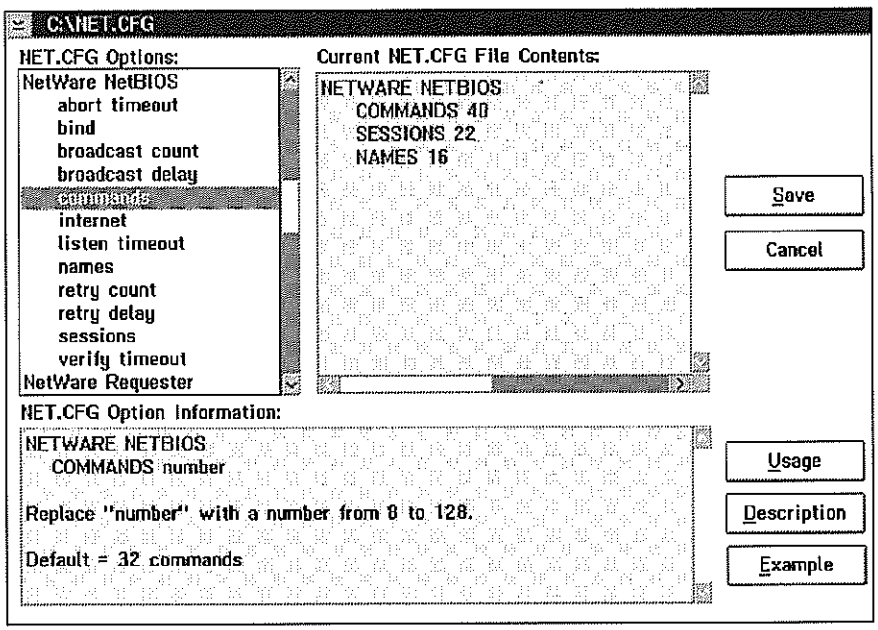


Figure 199. Novell NetWare Client Configuration Panel

5. Make the appropriate changes to the NetBIOS resource parameters, according to the resources needed to run your NetBIOS applications.
6. Save the configuration and close the Install utility.

You are now ready to use the Novell NetWare Client's NetBIOS emulation.

5.4.6.3 Using NetBIOS with DOS and WIN-OS/2 Applications

OS/2 Warp 4 allows you to run the Novell NetWare Client's NetBIOS or the MPTS NetBIOS in a DOS or WIN-OS/2. However, the type of support is different, since NetWare's NetBIOS support is not virtualized. This means that each session has a single-connection limitation and cannot use the same NetBIOS driver that is used by OS/2 sessions.

The MPTS NetBIOS support *is* virtualized, meaning that you can use the virtual NetBIOS support in multiple sessions. You can also use the MPTS or NetWare NetBIOS driver to provide the network support.

Novell NetBIOS Support: To use the Novell NetWare Client's own NetBIOS support, you must load the NetBIOS.EXE TSR program in the DOS session, just as you would to get NetBIOS support on an actual DOS workstation. When you use NetBIOS.EXE in a session, you cannot use NetBIOS from OS/2 sessions or from any other DOS or WIN-OS/2 sessions until NetBIOS.EXE is unloaded. You will have only one NetBIOS connection from a single session. *This is true even if your MPTS NetBIOS driver is loaded.*

To load the Novell NetWare Client's NetBIOS support, follow these steps:

1. Enable IPX support for virtual sessions. See 5.4.4.2, "Configuring Sessions" on page 372.
2. Disable NetBIOS support for OS/2 sessions. Novell's NetBIOS solution for DOS boxes is not virtual and doesn't allow other NetBIOS drivers to be running at the same time. Disable NetBIOS support by running the Novell NetWare Client installation program and deselecting NetBIOS Emulation for OS/2. See 5.4.6, "Running NetBIOS over IPX" on page 377.
3. Load NetBIOS.EXE in a single DOS session.
4. Configure NetWare's NetBIOS for DOS if necessary.

MPTS NetBIOS Virtual Support: MPTS provides a LAN Virtual Device Driver (LAN VDD) to enable DOS NetBIOS and IEEE 802.2 applications to share a network adapter with OS/2 NetBIOS and IEEE 802.2 applications. Your virtualized NetBIOS sessions can be supported by the NETBEUI.OS2 driver from IBM, the NetBIOS.SYS driver from Novell, or both. We recommend that you use this method when running NetBIOS applications from within a DOS or WIN-OS/2 session.

MPTS NetBIOS support follows the NetBIOS 3.0 (NB30) standard. You can run NetBIOS applications in a virtual session even if those applications do not conform with NB30. However, the need for increasing resources in a session is more likely when running non-NB30 applications.

When virtual sessions are supported by Novell's OS/2 NetBIOS driver, there is a potential limitation on the number of network connections that can be supported.

Avoiding Resource Errors: MPTS NetBIOS support for virtual sessions follows the NetBIOS 3.0 (NB30) standard. When it starts, a NetBIOS 3.0 application reserves a defined number of commands, sessions, and names.

If you run NetBIOS applications in several virtual sessions at once, all the NetBIOS resources in one of the NetBIOS components must be reserved and additional applications may not run. You will see a resource error when you try to make NetBIOS connections.

You can minimize the possibility that NetBIOS will run out of resources by doing both or either of the following:

- When using virtual NetBIOS connections, increase the default resources allowed for the NetBIOS driver in the MPTS configuration.
- Specify the resources consumed for each virtual session you use. See below for details on how to do this.

NetBIOS resource information for MPTS virtualized NetBIOS is stored using a program called LTSVCFG.COM. The LTSVCFG.COM program supports up to four network adapters. Note that you need only run this program if the numbers of NetBIOS resources required for your application exceed the default values.

1. Open the DOS or WIN-OS/2 session
2. Execute LTSVCFG.COM with the command line parameters you need.

   For example, to set the number of NetBIOS commands to 14, type the following:

   ```
   x:\IBMCOM\LTSVCFG.COM C=14
   ```

   The parameters that apply to NetBIOS resources are:

   s=number of NetBIOS sessions
   n=names
   c=commands

Note that you cannot set parameters for LTSVCFG.COM to amounts higher than amounts set for the NetBIOS.OS2 or NetBIOS.SYS driver in your MPTS configuration.

For more information about these and other NetBIOS parameters within MPTS, see Chapter 6, "Multimedia Applications and Utilities" on page 683.

5.5 Peer Networking

OS/2 Warp 4 lets you share your files, directories, printers and COM ports with other people on a local area network (LAN). When you share these items on the network, they are known as *network resources*. The other computers on this LAN may be running OS/2 Warp 4, or they may be running MS Windows for Workgroups, Microsoft Windows95, Microsoft Windows NT or Artisoft LANtastic 6.0 for DOS or OS/2. You can

choose which network resources you want to share on the network, and who will have access to these resources.

If you want to share your resources on the network, you do not need specialized network server software. Each computer can use OS/2 Warp 4, MS Windows for Workgroups, Microsoft Windows95, Microsoft Windows NT or LANtastic, and their users can both share their own resources and access other systems' resources. This is known as *peer networking*, and the feature of OS/2 Warp 4 that allows you to do this is called Peer Services. You have the option to install this service when you install the File and Print Client. For details on the installation and configuration of the File and Print Client, see 5.1, "Installing OS/2 Warp 4 Network Components" on page 262.

Note that using the File and Print Client to connect to a LAN does not prevent you from accessing other resources that may reside on your LAN, such as IBM Warp Server or IBM LAN Server, Novell NetWare Server, Microsoft Windows NT Server or even TCP/IP resources such as the Internet or FTP servers. OS/2 Warp 4 allows you to connect to any of these types of server at the same time, and access their resources.

New in OS/2 Warp 4

If you choose to install **LAN Server Administration** besides using Peer Services, you can now administer IBM Warp Server or IBM LAN Server using the LAN Server Administration tools from your peer requester machine. To do this, however, you must have administrator rights for the servers in question.

5.5.1 Accessing Resources

5.2.6, "Browsing Available Network Resources" on page 322 describes how to use the File and Print Client Resource Browser to access network resources on other systems. The method that you use to gain access is the same, regardless of whether these resources reside on servers or on peer workstations.

5.5.2 Setting Your User ID and Password

When you install OS/2 Warp 4 with the File and Print Client on your computer, you will be prompted to enter a user ID and password. The user ID that you enter will become the peer administration user ID for your OS/2 Warp 4 system. You must log on using this user ID before you can share resources.

A Change with OS/2 Warp 4

Previous versions of OS/2 and OS/2 Warp 4 included a default user ID *USERID* and password *PASSWORD*. This could cause a security exposure since, unless you remembered to delete this user ID, other users who knew of its existence could use it to gain access to your system. With OS/2 Warp 4, this user ID is no longer present, eliminating this potential exposure.

This means, however, that you must remember the user ID and password that you enter during OS/2 Warp 4 installation, or you will be unable to share resources.

In order to configure network resources on your machine, you must first identify yourself to OS/2 Warp 4 by logging on using the peer administration user ID that you entered during installation.

5.5.3 Sharing Your Resources

There are many resources on your OS/2 Warp 4 system that you might want to share with another user on a network. There are several ways that you can share and administer such resources:

- Using resources' context menus or Properties notebooks from the Workplace Shell
- Using the Shared Resources and Network Connections notebook
- Using the NET SHARE command

The NET SHARE command will not be discussed in this chapter. See the online documentation for the File and Print Client if you want more information on how to use this command.

5.5.3.1 Using the Workplace Shell

After you have logged on using the peer administration user ID and password, you can share a drive, directory or printer directly from the Workplace Shell, by clicking your right mouse button on the object's icon to display its context menu, then selecting the **Start sharing...** item, as shown in Figure 200 on page 385.

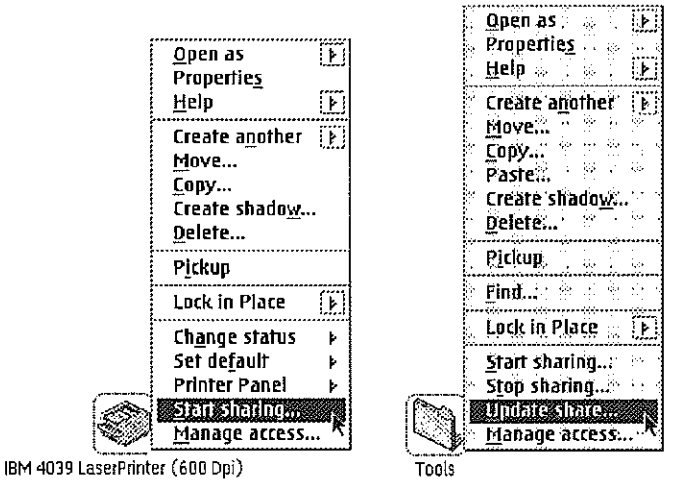


Figure 200. Sharing Using an Object's Context Menu

If you have previously shared this object and you want to update the access profile for the resource (that is, the users who may access it and the level of access granted to each user), you can select the **Update share** item from the context menu. See 5.5.3.3, "Configuring Share Profiles" on page 388 for more information on share profiles.

Alternatively, you can open a resource's Properties notebook, and use the Shares tab to start and control sharing of the resource, as shown in Figure 201 on page 386.

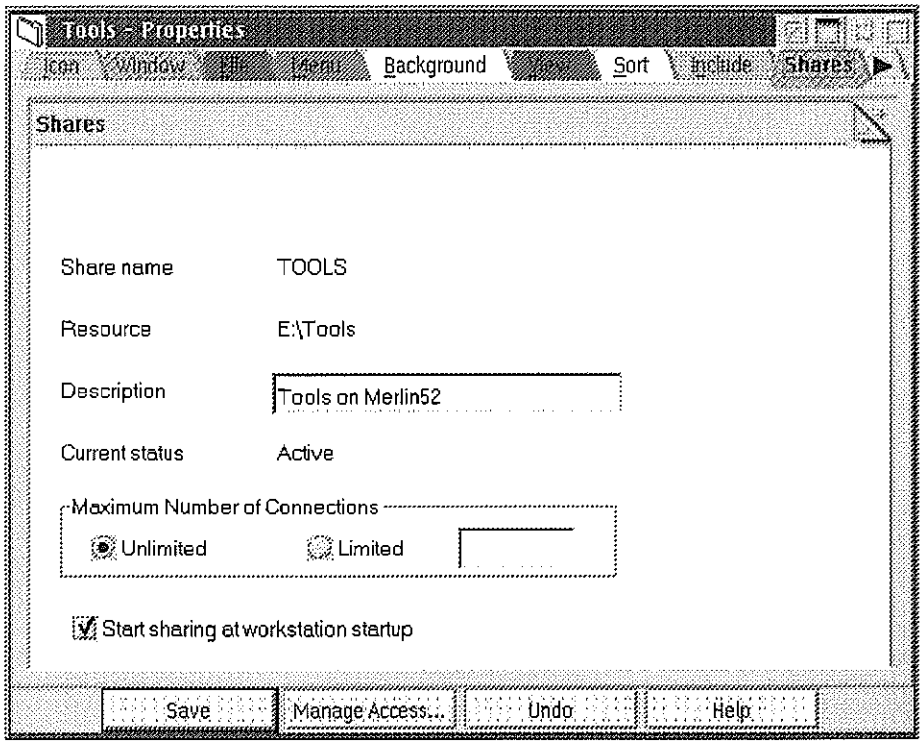


Figure 201. Sharing Using an Object's Properties Notebook

This method allows you to automatically share the resource on the network as soon as you boot your OS/2 Warp 4 system, by selecting the **Start sharing at workstation startup** check box.

5.5.3.2 Using the Shared Resources and Network Connections Notebook

Click on **Connections=> Network=> Network Services=> Shared Resources and Network Connections** to share resources and configure access to them.

Dragging and Dropping Objects: You can use drag-and-drop techniques to share a resource, using the following steps:

1. Select the **Shares** tab from the **Shared Resources and Network Connections** notebook, as shown in Figure 202 on page 387.
2. Drag and drop a printer, drive or directory object from your desktop or a folder, onto the Shares page.

If this is the first time you are sharing this resource, OS/2 Warp 4 will ask you to create a share profile for the resource. See 5.5.3.3, "Configuring Share Profiles" on page 388 for more information on how to create a share profile.

Using the Dialogs: You can use the Create Share... button in the Shared Resources and Network Connections notebook to define a new resource to be shared, as follows:

1. Select the **Shares** tab in the **Shared Resources and Network Connections** notebook, as shown in Figure 202.

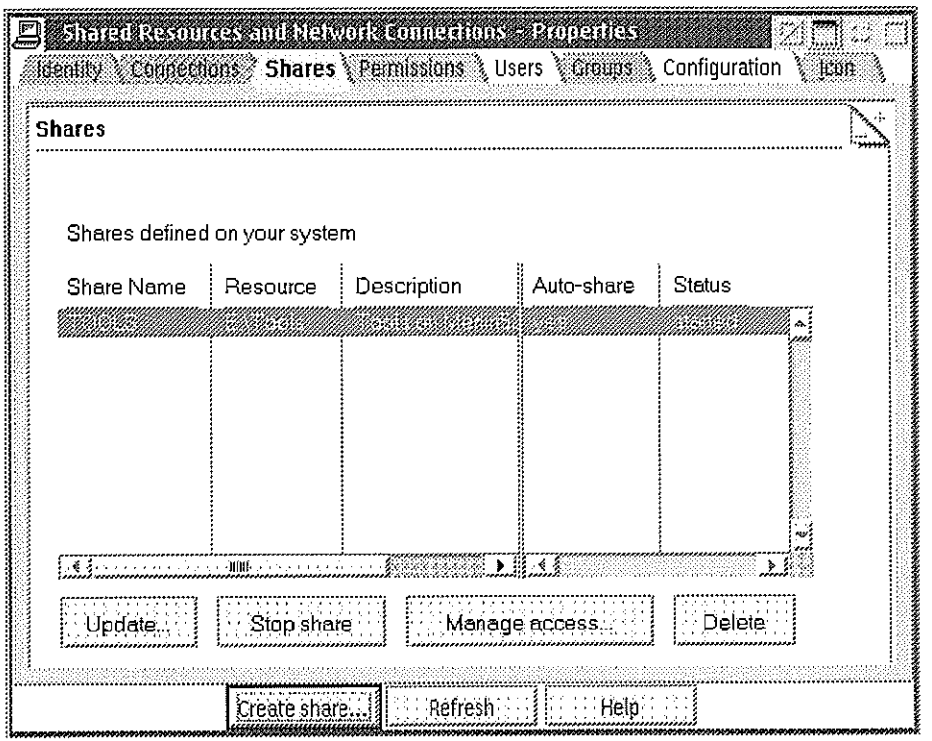


Figure 202. The Shared Resources and Network Connections Notebook

2. Select the **Create Share...** button. OS/2 Warp 4 will display the Select a Resource to Share dialog, as shown in Figure 203 on page 388.

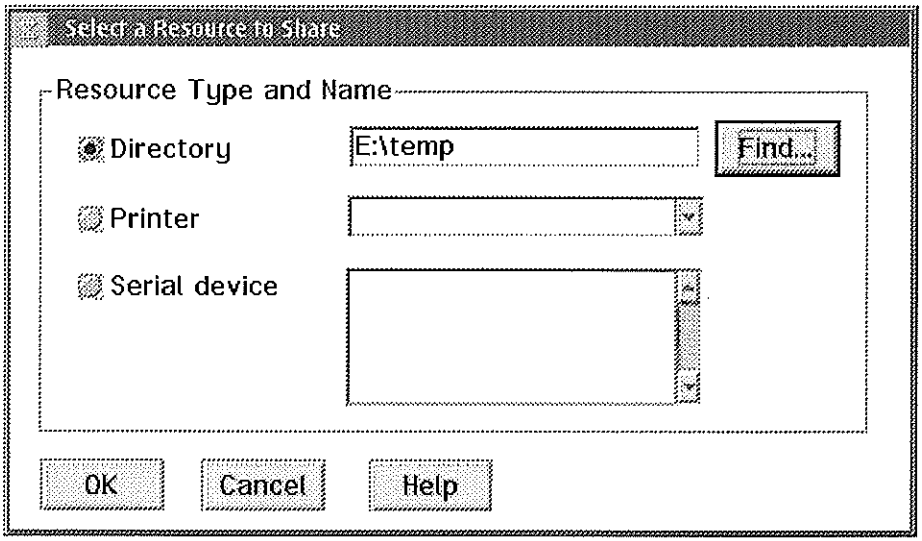


Figure 203. Sharing a Directory

You can now select the type of resource you wish to share: directory, printer or serial device (comms port).

If you want to share an entire drive (especially one with removable media, such as a CD-ROM), select only the drive letter, such as E:. If you want to share a directory rather than an entire drive, enter the fully qualified path to that directory, as shown in Figure 203. Select the **Find...** button if you do not know the directory path.

If you are sharing an application, share the directory that contains the application and the files it needs to run. If all the application files are not already in one directory, you should put them in the same directory to simplify sharing the application and to reduce the possibility of a user receiving errors while running the application. If some of the files must reside in subdirectories, it is especially important to grant access to these subdirectories for any other users who will access the application (see 5.5.3.3, "Configuring Share Profiles").

If you wish to share a printer or a serial device, select the appropriate radio button, and then select the name of the resource from the list provided.

Select the **OK** button to continue. OS/2 Warp 4 will display the Create a Share dialog. For information on what to do next, see 5.5.3.3, "Configuring Share Profiles."

5.5.3.3 Configuring Share Profiles

The first time you share a resource, OS/2 Warp 4 creates a share profile. A share profile contains all the information about a shared resource, including who is allowed to access it.

Share profiles are displayed on the Shares page in the Shared Resources and Network Connections notebook. You can modify a resource's share profile in any of three ways:

- Using the Update Share options on the resource object's context menu, as shown in Figure 200 on page 385.
- Using the Shares page on the resource object's Properties notebook, as shown in Figure 201 on page 386.
- Using the Shares page on the Shared Resources and Network Connections notebook

Any of these methods will produce the same result. The choice of which method you use is entirely up to you.

When you have identified the resource that you wish to share, OS/2 Warp 4 will present you with the Create a Share dialog, as shown in Figure 204.

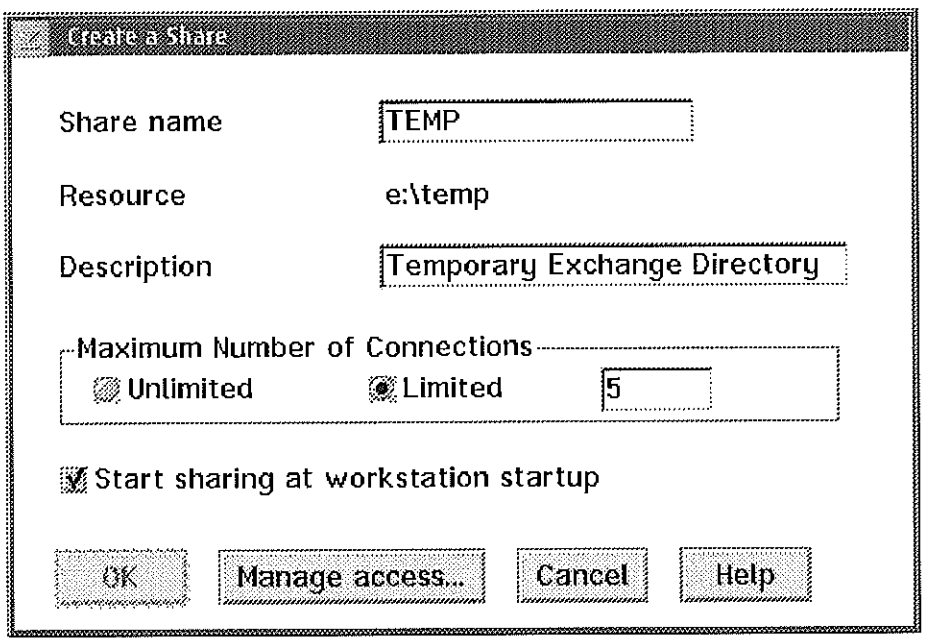


Figure 204. Create a Share Dialog

This dialog allows you to specify any additional information not already known about the resource. If you are updating an existing share profile, the same dialog box appears, but its title is Update a Share.

Important!

When you are providing information for creating a new share profile, you cannot select the **OK** button until you have provided access control information for your resource. Working on the Update a Share dialog allows you to select **OK** right away, because you have already provided access information when creating the share profile. Managing access control information is discussed in 5.5.4, "Managing Access to Resources" on page 391.

The Share name field determines the name by which other users will identify and connect to this resource on the network, so it should be short but descriptive. This name will also appear in your own Shared Resources and Network Connections notebook. OS/2 Warp 4 will provide you with a default name, but you can change this if you wish (note, however, that share names for printers cannot be changed). The Resource field identifies the local device name or path of the resource on your computer. Since you have already specified this information, you cannot change it here. If you find you have made a mistake and do not wish to share the resource as indicated, click on the **Cancel** button to cancel sharing, then start again with the correct resource.

The Description field is optional, and simply provides additional information about the resource. You can place any other information about the resource in this field if you wish.

The Maximum Number of Connections box allows you to control the number of users who can concurrently access this resource. For example, if your computer is rather slow, you will not want to have a hundred other people trying to access your disk on the LAN. However, you may want to grant access to one or two people at a time. Either select **Unlimited** to allow anyone to access the resource, or selected **Limited** and supply a number in the field at the right.

If you want the resource to be shared automatically when you start your computer, select the **Start sharing at workstation startup** check box.

At this point, you have defined the resource for sharing on the LAN. However, OS/2 Warp 4 does not allow any other users to access this resource until you define access control privileges for the resource. These privileges form part of the share profile for the resource, and are important because they prevent other users from accessing your resources unless you want to grant them access. To define access control privileges from this point, select the Manage access... button. See 5.5.4, "Managing Access to Resources" on page 391 for details on how to define access control privileges.

5.5.4 Managing Access to Resources

When you share disks and directories as resources on the network, you must grant access to these resources before anyone on the network can access or use it. In this

way, OS/2 Warp 4 ensures that the information on your computer is kept secure, and not available to just anyone.

Note that by default, OS/2 Warp 4 allows all users access to printers or comms ports that you share as resources. You do not need to define specific access control privileges for printers or comms ports.

Before sharing or accessing resources on the LAN, each user needs to log on to his/her computer, just as you do. The user ID identifies him/her to your computer when he/she wishes to access resources on your computer. You can tell OS/2 Warp 4 to allow different users to access different resources, and only the users that you specify will be able to access your resources.

In order to simplify matters when you are granting access to resources, OS/2 Warp 4 lets you create groups of users, and then assign levels of access to the entire group. In this way, you do not need to assign levels of access to every individual user which speeds up the process.

When you grant access to a resource, you create an *access control profile* for that resource, which is stored as part of the share profile for the resource. The access control profile specifies which users have access to a shared resource on your computer, and what type of access these users have. A detailed view of all existing access control profiles on your workstation is provided by the Permissions page in your Shared Resources and Network Connections notebook.

You can create an access control profile in any of the following ways:

- Select the **Manage Access...** item on the resource object's context menu, as shown in Figure 200 on page 385.
- Select the **Manage Access...** button on the Shares tab in a resource's Properties notebook
- Select the **Manage Access...** button from the Shares page in the Shared Resources and Network Connections notebook

OS/2 Warp 4 will present you with the Manage Access dialog, which allows you to specify the type of access that you want for this resource. This dialog is shown in Figure 205 on page 392.

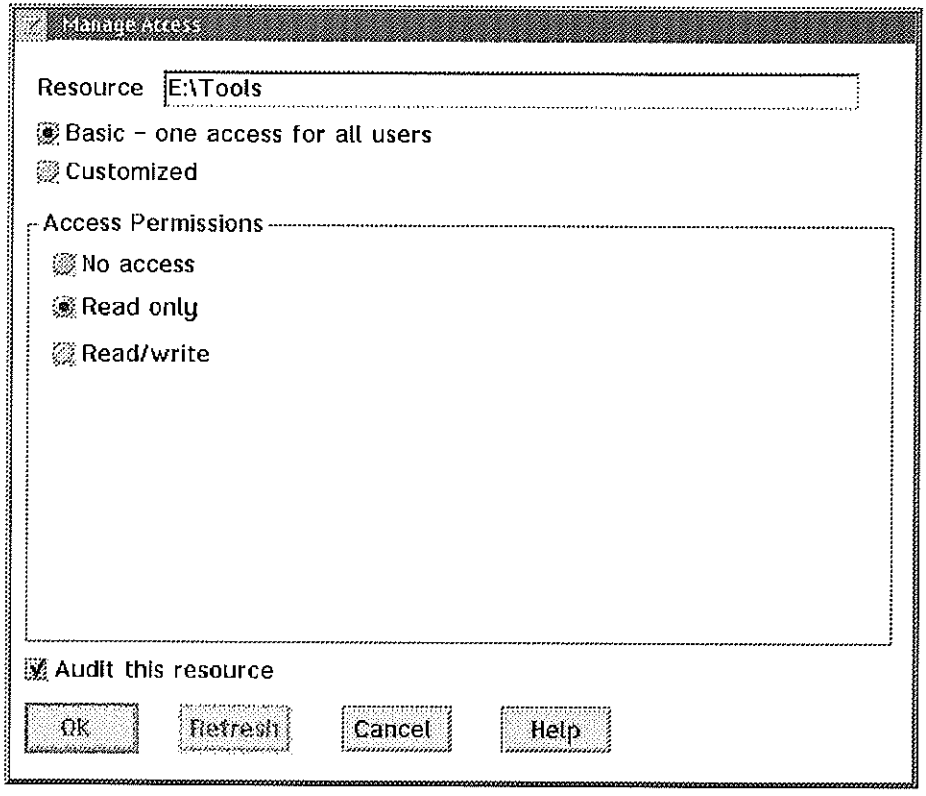


Figure 205. Manage Access Dialog (Basic Access)

You can manage access to your resources in one of two ways:

- You can allow all users to have the same level of access (for example, read access only, or read-write access). This is called *Basic access*.
- You can specify different levels of access for different users on the network. This is called *Customized access*.

You can define different types of access for different resources, and you can modify the access control profile at any time.

OS/2 Warp 4 allows you to specify very detailed access control information for a resource. For example, if you are sharing a directory that contains one or more subdirectories, you can set individual access privileges for each subdirectory using the Permissions tab in the Shared Resources and Network Connections notebook, as shown in Figure 206 on page 393.

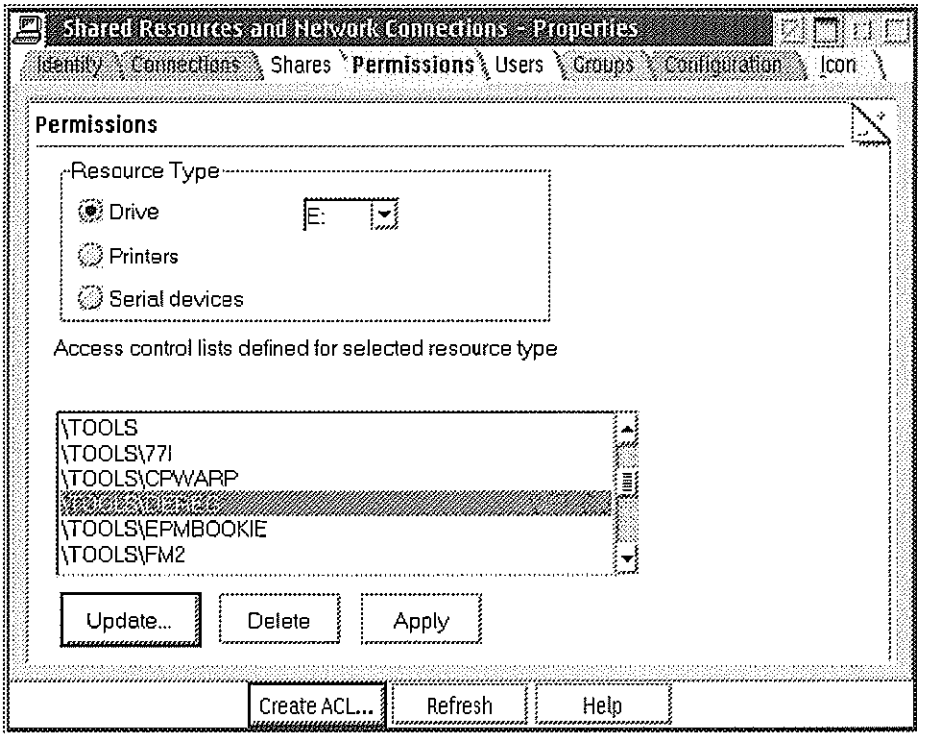


Figure 206. Permissions Dialog

5.5.4.1 Basic Access

If you want to grant the same level of access to a resource for all users, follow the steps below:

- In the Manage Access dialog, select **Basic - one access for all users**. This is the default option, as shown in Figure 205 on page 392.
- Select the level of access that you want to give users accessing this resource.
- If you want to keep a record of who accesses this resource, select the **Audit this resource** check box. When you select this option, any future access to this resource is recorded in the audit log. The audit log can be viewed and managed from the Audit Log Utility, which is discussed in 5.2.12, "Auditing Network Access" on page 340.
- Select the **Save** button to save and activate the specified access.

- If this resource is a directory that has subdirectories, OS/2 Warp 4 will ask whether you wish to apply this level of access to the subdirectories as well. Select **Yes** if you want to apply the access to all subdirectories.

  If you select **No**, the level of access that you specified will apply to the parent directory, but no network users will have any access to the subdirectories.

5.5.4.2 Customized Access

If you want to grant different levels of access to different users, select the **Customized** radio button from the Manage Access dialog. When you select this button, the contents of the Manage Access dialog will change, as shown in Figure 203 on page 388.

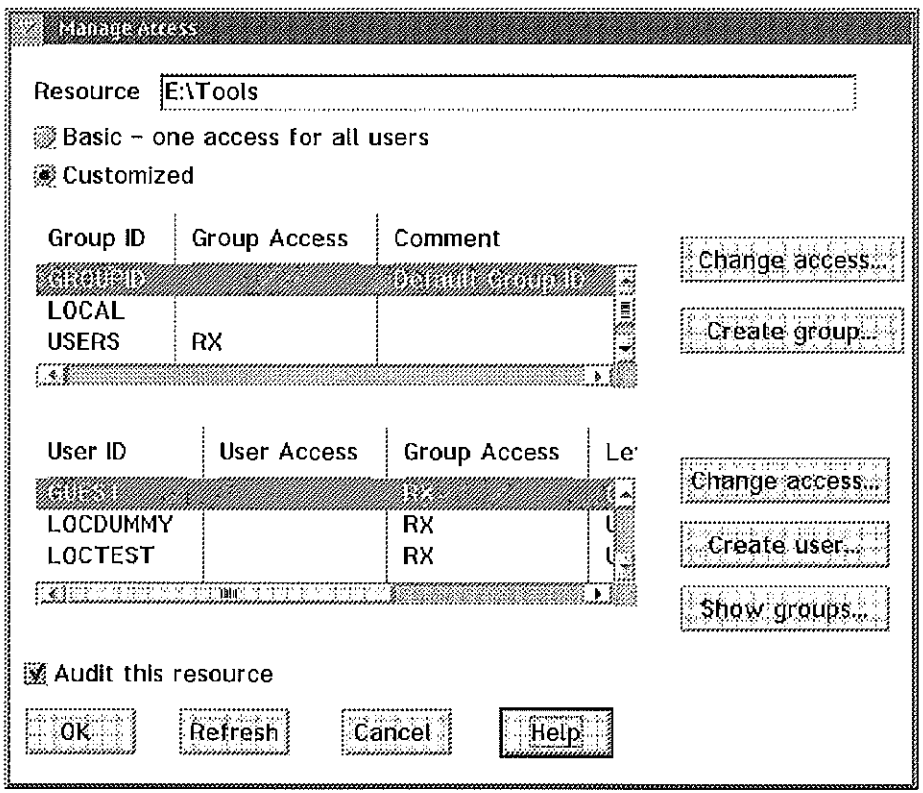


Figure 207. Manage Access Dialog (Customized Access)

All the users and groups of users that are defined in your OS/2 Warp 4 system are listed in the Manage Access dialog, along with their current access permissions for this resource. If you have not yet defined any users or user groups, or if you need to add new ones, see "Defining a New User" on page 396 or "Defining a New Group of Users" on page 398 for guidance on how to do this.

Select the user or group for which you want to customize access, then select the **Change access** button. OS/2 Warp 4 will now display the Change Access Permissions dialog, as shown in Figure 208 on page 395. This dialog shows the current access permissions (if any) granted to the selected user or group for this resource.

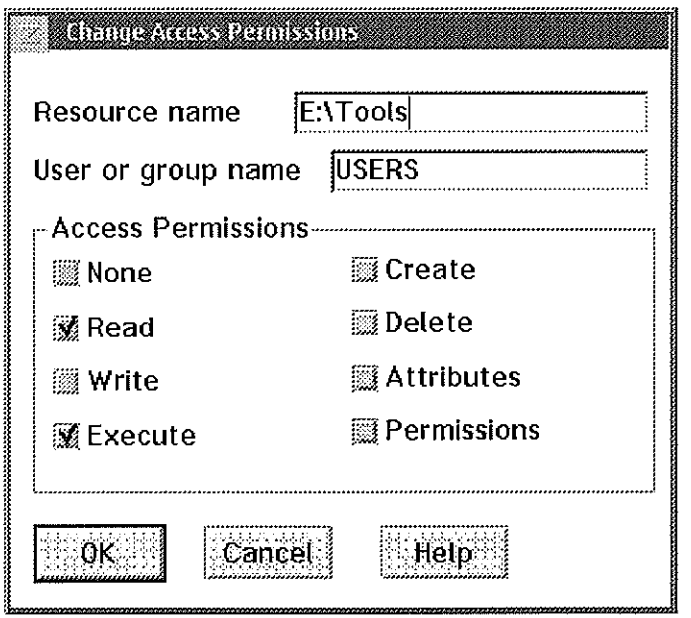


Figure 208. Change Access Permissions Dialog

Select the appropriate check boxes to give the user or group the desired access permissions for this resource. You can select more than one access permission (unless you select **None**). When you have specified the access permissions you want, select **OK** to return to the Manage Access dialog. Note that the access permissions you selected are now displayed.

If you want to keep a record of who accesses this resource, select the **Audit this resource** check box. When you select this option, any future access to this resource is recorded in an audit log file. This log can be viewed and managed from the Audit Log Utility, which is discussed in 5.2.12, "Auditing Network Access" on page 340.

Select the **Save** button to save and activate the specified access.

If this resource is a directory that has subdirectories, OS/2 Warp 4 will ask whether you wish to apply this level of access to the subdirectories as well. Select **Yes** if you want to apply the access to all subdirectories. If you select **No**, the level of access that you

specified will apply to the parent directory, but no network users will have any access to the subdirectories.

Defining a New User: Before a network user can access any resources on your OS/2 Warp 4 system, you must define that user to OS/2 Warp 4 in either of two ways:

- The primary user administration functions within Peer Services are placed on the Users page in the Shared Resources and Network Connections notebook.

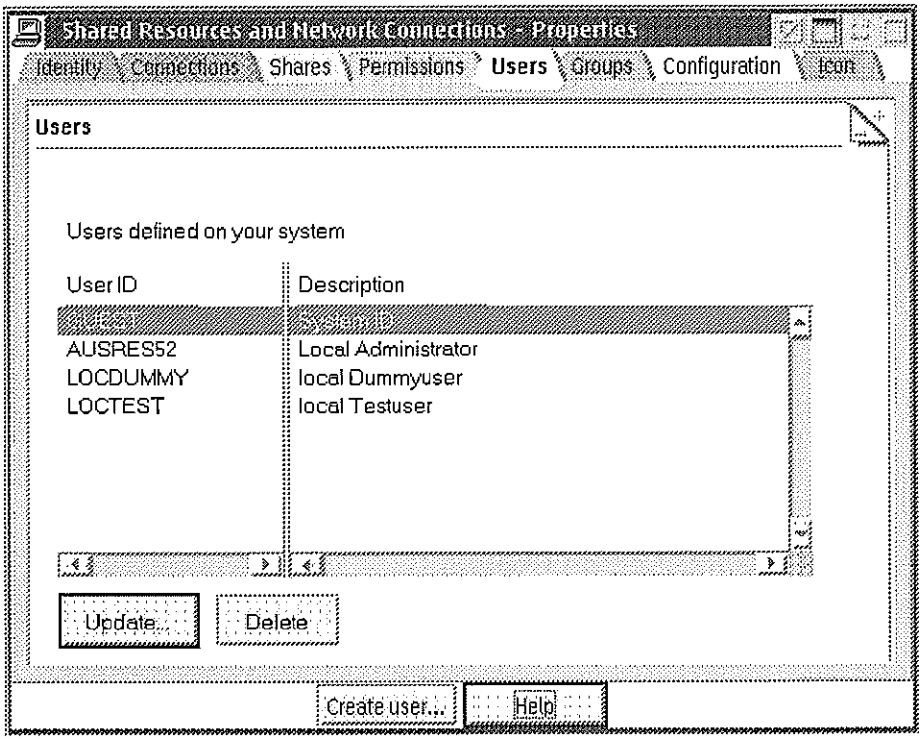


Figure 209. Users Page

Selecting the **Create User...** button will display the Create a User Account dialog shown in Figure 210 on page 397.

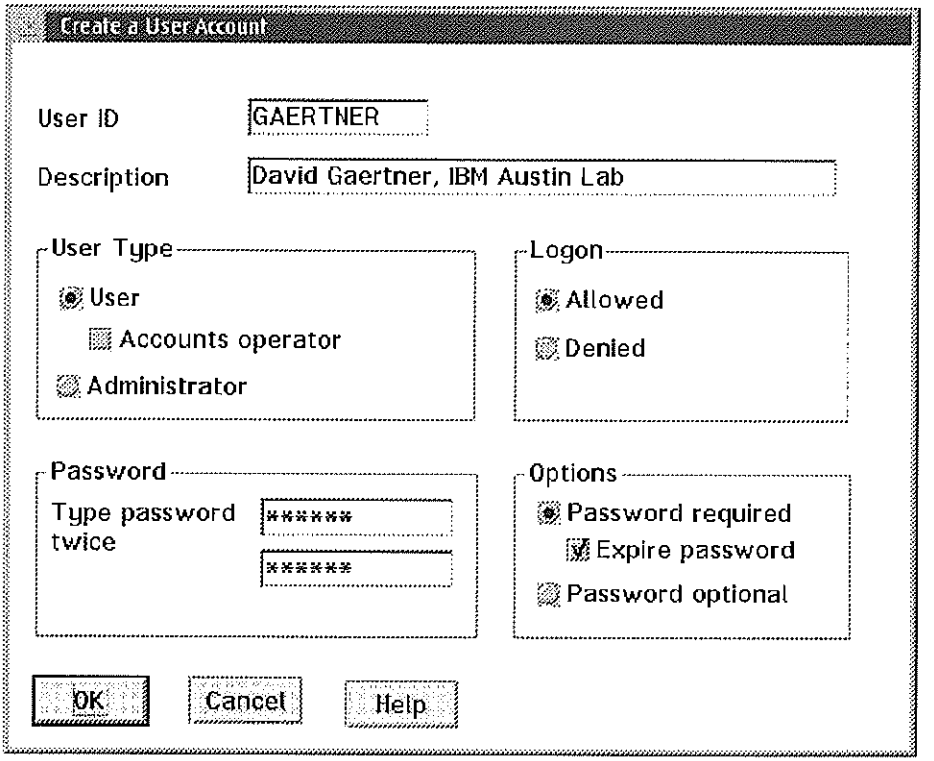


Figure 210. Create User Account

In addition to creating a new user, you can also update a user's profile by selecting the **Update...** button. The same dialog is displayed. To delete a user account simply select the user from the list, then select the **Delete...** button.

- You can define a new user from the Manage Access dialog, by selecting the **Create user...** button as shown in Figure 207 on page 394. OS/2 Warp 4 will display the **Create a User Account** dialog, just as if you were creating a new user from the Users page in the Shared Resources and Network Connections notebook.

In the Create a User Account dialog, you can define a profile for the new user, as follows:

User ID This field identifies each user to your OS/2 Warp 4 system. Each user ID must be unique on system, but can also be defined elsewhere (for example, on a LAN Server domain or another peer workstation).

Description This field is optional. You can enter a description for each user if you wish.

User type Select the radio button that indicates the level of access authority you want to give to this user account. User access allows the user to access resources according to the access privileges that you assign. Administrator access allows the user to access and manage all user accounts, resources and connections on your system.

If you want the user to be able to manage other users and groups on your workstation, select the **Accounts operator** check box. A user with accounts operator privilege can add, change or delete users and groups, but cannot create or change user accounts that have administrator or accounts operator privilege.

Logon Select one radio button to indicate whether the user account is allowed to log on to your system. If you select **Denied**, the user is restricted from logging onto your system, but the user account is maintained, so that you do not need to recreate it if you need it again later.

Password If you want the user to provide a password for logon, enter that password here.

Options Select a radio button to indicate whether the user account *must* specify a password to log on to your workstation.

If you want the initial password to expire the first time the user logs on, select the **Expire password** check box. The user is then required to change the password during the first logon.

After entering all the desired information, select **OK** to create the new user account. You can now add this user account to a group of users, or define access privileges for the account.

Defining a New Group of Users: Groups allow you to define common access privileges for a number of users at the same time. For example, you might want all the users in a particular department to have the same access privileges to a number of resources. You can place all these users in a group, then grant access for the entire group to the resources that they require. This speeds up the process of defining access to resources.

Adding a group of users is similar to adding an individual user.

- The primary group administration functions within Peer Services are placed on the Groups page in the Shared Resources and Network Connections notebook, as shown in Figure 211 on page 399.

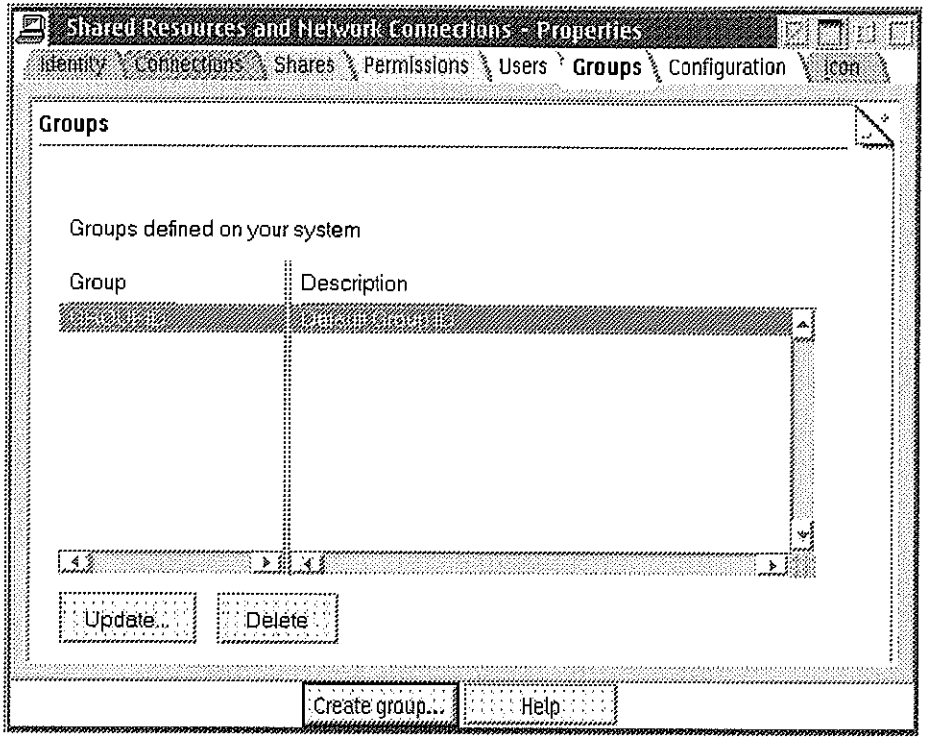


Figure 211. Groups Page

Selecting **Create Group...** will display the Create a Group dialog, as shown in Figure 212 on page 400.

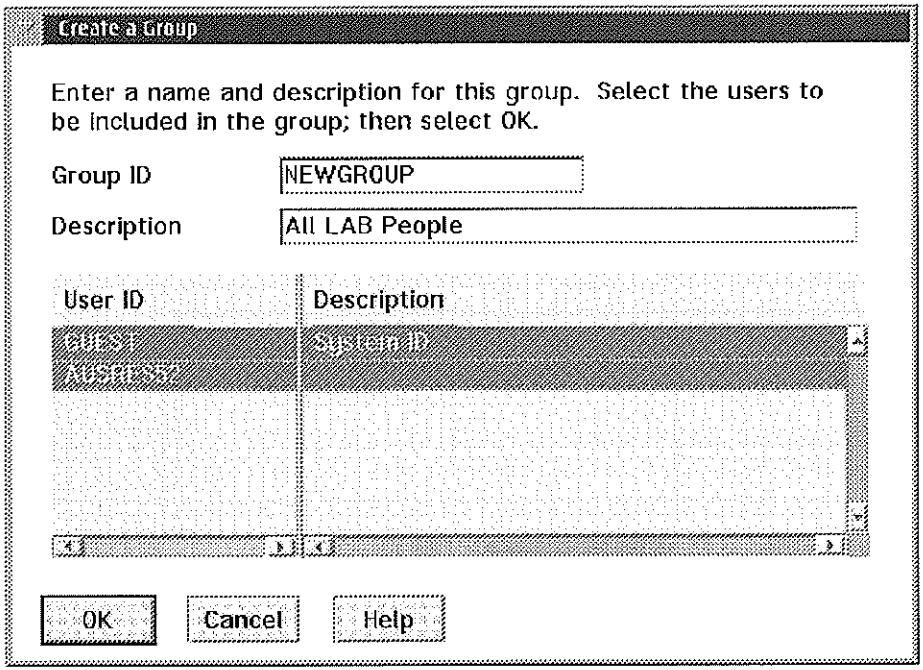


Figure 212. Create a Group

In addition to creating a new group, you can also update a group's profile by selecting the **Update...** button. The same dialog is displayed. To delete a group, select the **Delete...** button.

- You can also create a group from the Manage Access dialog, by selecting the **Create groups** button as shown in Figure 207 on page 394. OS/2 Warp 4 will display the Create a Group dialog as shown in Figure 212.

You now can define a new group providing the following information:

Group ID This field identifies a group of users on your OS/2 Warp 4 system. The Group ID must be unique.

Description This field is optional. For easier management, however, you should provide a description for the group.

User list You can select all the users you wish to include in this group, by simply clicking on their entries in the list.

When you have defined the group as you want it, select the **OK** button to create the group.

5.5.5 How to Stop Sharing Resources

At some point after you have shared a resource example, you might want to share a particular directory only when a friend or colleague requests access to it.

To stop sharing a resource, you can use a number of methods:

- Use the context menu for the Workplace Shell object that represents the resource (see Figure 200 on page 385)
- Use the Shared Resources and Network Connections notebook
- Use the NET SHARE command

Note that these methods differ slightly in their effect on the share profile for a resource. Some methods will keep the share profile, allowing you to share the resource again at a future time, without the need to recreate the share profile. Others will delete the share profile and you will need to recreate it if you want to share the resource again later. See the following sections for further details.

5.5.5.1 Using the Workplace Shell

To stop sharing a resource from the Workplace Shell, click your right mouse button on the resource's icon to display the context menu. Select the **Stop sharing...** menu item. OS/2 Warp 4 will display a dialog asking you to confirm your intention to stop sharing the resource, as shown in Figure 213.

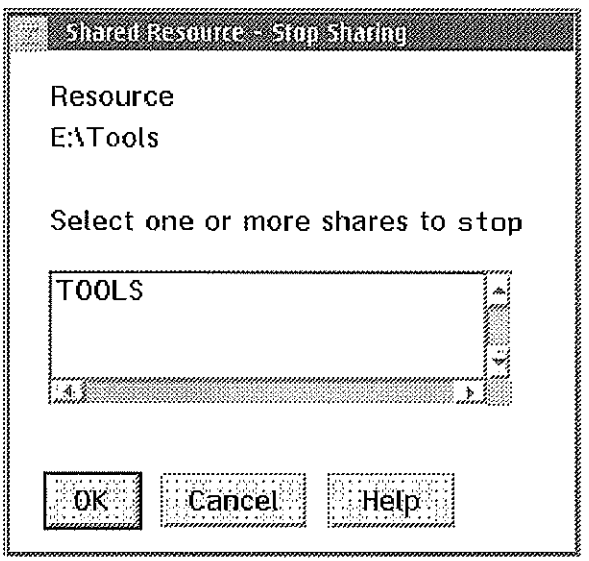


Figure 213. Stop Sharing

Selecting the **OK** button will stop sharing the resource on the network. No users will be able to access the resource until you start sharing it again. However, the share profile for the resource will remain on your computer, along with the access control profile for the resource. Therefore you will not need to go through the entire process of defining the resource and granting access privileges to it.

5.5.5.2 Using the Shared Resources and Network Connections Notebook

From the Shared Resources and Network Connections notebook, you can stop sharing a resource in the following two ways:

- Selecting the **Stop share** button stops sharing the resource, which means that no users can access the resource. However, it *does not* delete the share profile. To restart sharing, you only need to start sharing the resource. You do not need to redefine all the information for the share profile. Selecting the **Stop share** button immediately switches the status of the resource from **started** to **stopped.**
- Selecting the **Delete** button will stop sharing the resource *and* delete the share profile. In order to share the resource again later, you will need to re-enter all the share profile information and redefine access to the resource for users. Select the **Delete** button and confirm your intention to remove all of the share information.

5.5.6 Additional Options

The Shared Resources and Network Connections notebook contains some additional pages that allow you to enter more information and specify further options for Peer Services. The following sections provide a brief description of these pages and how you can use them.

5.5.6.1 Changing Your Identity

The Identity tab allows you to display or change information about your OS/2 Warp 4 system, and to automatically start Peer Services. This page is shown in Figure 214 on page 403.

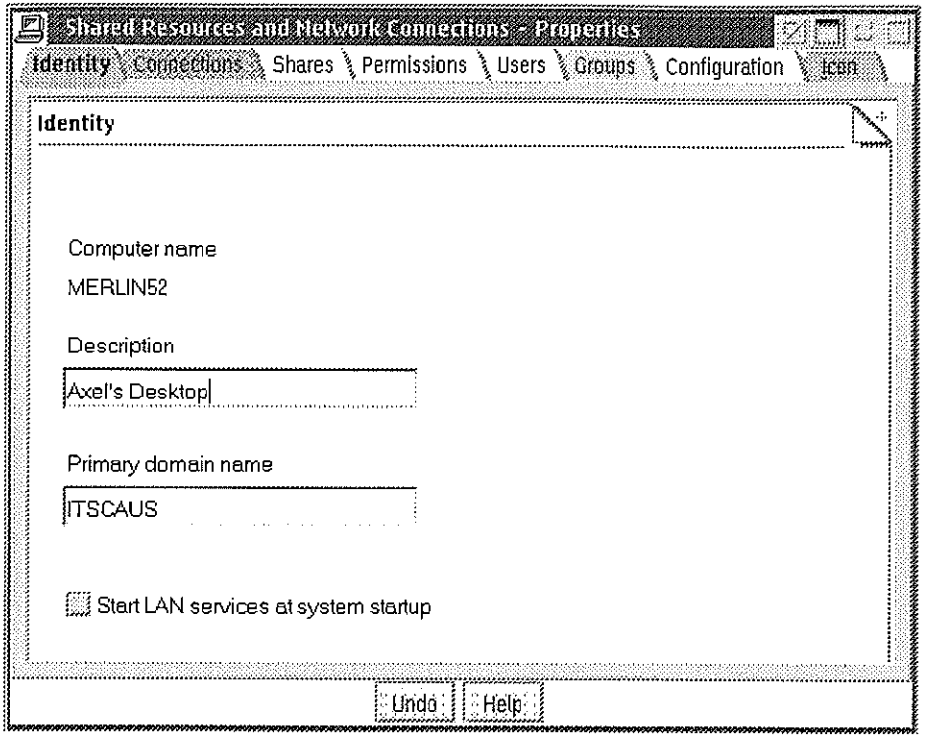


Figure 214. Identity Page

The Computer name field is assigned at installation time, and cannot be changed here. If you wish to change this field, you need to edit the \IBMLAN\IBMLAN.INI file on your hard disk.

The Description field allows you to provide a name for your OS/2 Warp 4 system that is more descriptive than that shown in the Computer name field. The name entered in the Description field is visible to other users when they browse the network.

You can change the domain or workgroup to which you log on by default by changing the name entered in the **Primary domain name** field. Note that any changes you make to this field will be permanent, and the new domain or workgroup name will remain in effect until you change it back again.

If you wish to start Peer Services services automatically when you boot your OS/2 Warp 4 system, you should select the **Start LAN services at system startup** check box. This will cause Peer Services to start when you boot OS/2 Warp 4, rather than waiting until you manually start the service or until you attempt to access a network resource.

5.5.6.2 Connecting to Network Resources

Connecting to network resources shared by other systems on your network, using the File and Print Client Resource Browser, is described in 5.2, "Local Area Network (LAN)" on page 305. However, you can also use the Connections tab in the Shared Resources and Network Connections notebook to view your current connections and to make new connections to such resources, as shown in Figure 215.

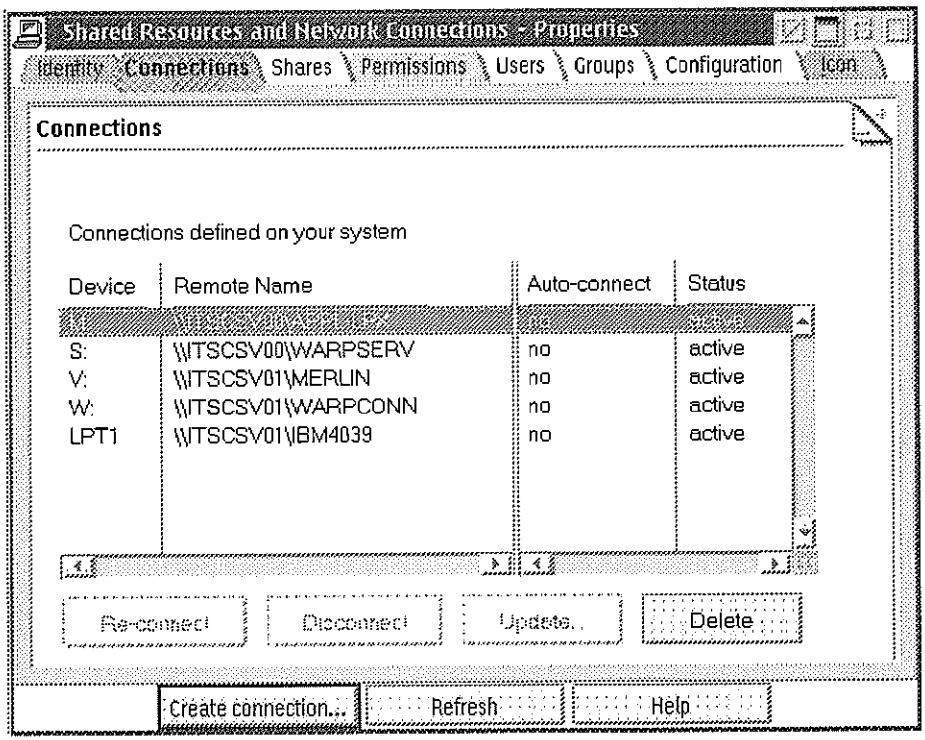


Figure 215. Connections Page

Use the **Create Connection...** button to create a new connection. If you want to update the details of a current connection, choose a connection from the list and select the **Update** button.

Note that this is the *only* way to create a permanent connection to a resource provided by another peer workstation, by selecting the **Connect to resource at logon** check box when creating or updating the connection details.

Because of the similarities in creating connections using the Shared Resources and Network Connections notebook and the ways we have already described in 5.2, "Local Area Network (LAN)" on page 305, we will not cover them again here.

5.5.7 Working with Multiple Domains

Peer Services handles workgroups in the same way that it handles server domains. Peer Services therefore refers to both domains and workgroups simply as *domains*. Because your network can have more than one domain on it, you may sometimes need to connect to peer workstations on other domains. You can access these workstations more easily if these domains are listed in the `othdomains` parameter in your IBMLAN.INI file.

When you add a domain to the `othdomains` parameter, icons for servers and peer workstations in the domains are added to the File and Print Client Resource Browser in your Network folder and to the workstation list in the Shared Resources and Network Connections notebook.

The `othdomains` parameter supports up to four domain names. If you have a network with more than four domains, you can still access the systems in the domains not specified in the `othdomains` parameter, simply by using their computer names directly.

When you add a domain to the `othdomains` parameter in your IBMLAN.INI file, the parameter will appear similar to the following:

```
othdomains = FINANCE,PERSONNEL
```

If you make changes to IBMLAN.INI while Peer Services is running, you must stop Peer Services and restart the service again before the changes will take effect. Do this by typing `NET STOP REQ` at a command line. After the service has been successfully stopped, start it again by typing `NET START REQ`.

5.5.8 Monitoring Peer Resources

You can view the network-related activity on your OS/2 Warp 4 system, using the different views provided by the Shared Resources and Network Connections object. If you click your right mouse button on the **Shared Resources and Network Connections** object to display its context menu, you will notice three items at the bottom of the menu:

- Clicking on **Statistics...** displays statistical information on your shared resources and network traffic
- Clicking on **Open files...** displays the files currently opened by network users on your OS/2 Warp 4 system
- Clicking on **Active sessions...** displays the users who are currently connected to resources on your OS/2 Warp 4 system.

Selecting any of these three options will display a dialog showing the appropriate information. Each dialog is briefly explained below. If you need more detailed information, see the online documentation for the File and Print Client.

5.5.8.1 Statistics

The Statistics dialog is shown in Figure 216.

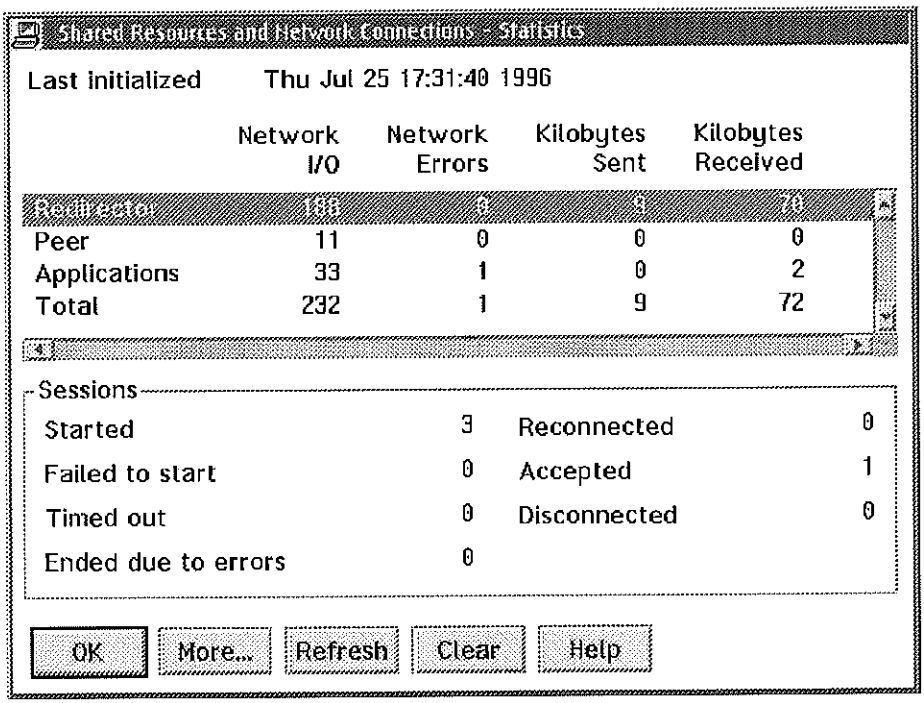


Figure 216. Statistics - Page 1 of 2

The first Statistics page displays the network traffic and number of network sessions generated by your OS/2 Warp 4 system. You can see how much data you have sent or received over the network, and any network errors that occurred.

The second Statistics page displays a summary of network activity on your OS/2 Warp 4 system, as shown in Figure 217 on page 407.

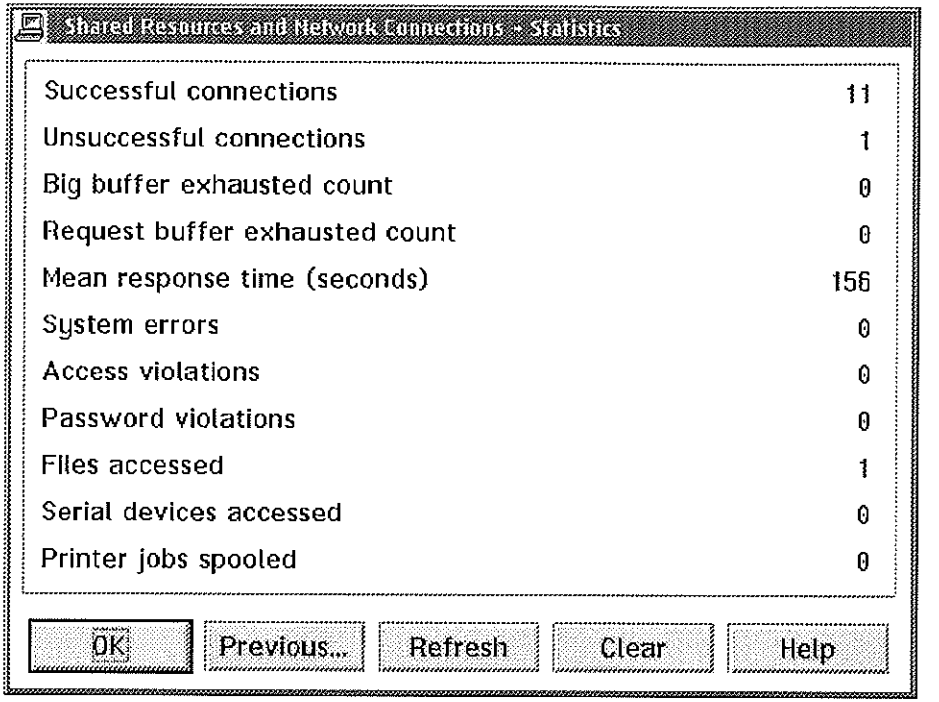


Figure 217. Statistics - Page 2 of 2

This page displays information on your network connections, buffers, the devices that were accessed, and any access errors or password violations that occurred. This information allows you to gain an overview of the network activity occurring on your OS/2 Warp 4 system.

5.5.8.2 Open Files

The Open Files dialog displays the names of all files currently opened by network users on your OS/2 Warp 4 system, as shown in Figure 218 on page 408.

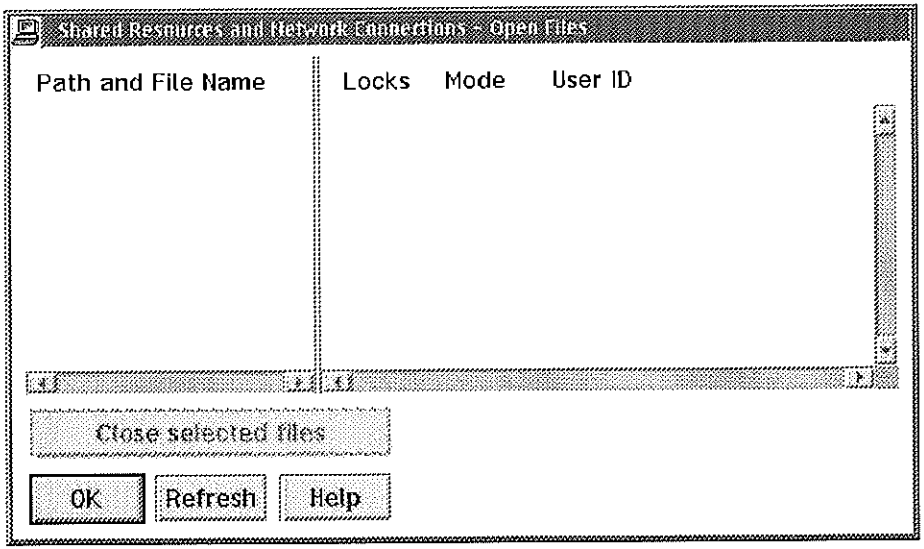


Figure 218. Open Files Information

If you wish, you can force closure of selected files. You might want to do this if too many files are currently open, causing network errors when additional users try to access your resources. For example, a user may have opened many files on your system, then gone home or out to lunch, leaving those files open. Since the number of files that may be opened by network users is a finite number (determined by the Open files field on the first Configuration page of the Shared Resources and Network Connections notebook), this may cause errors when other users attempt to open files on your system.

5.5.8.3 Active Sessions

The Active Sessions dialog shows the network sessions that are currently in effect between your OS/2 Warp 4 system and other users on the network, as shown in Figure 219 on page 409.

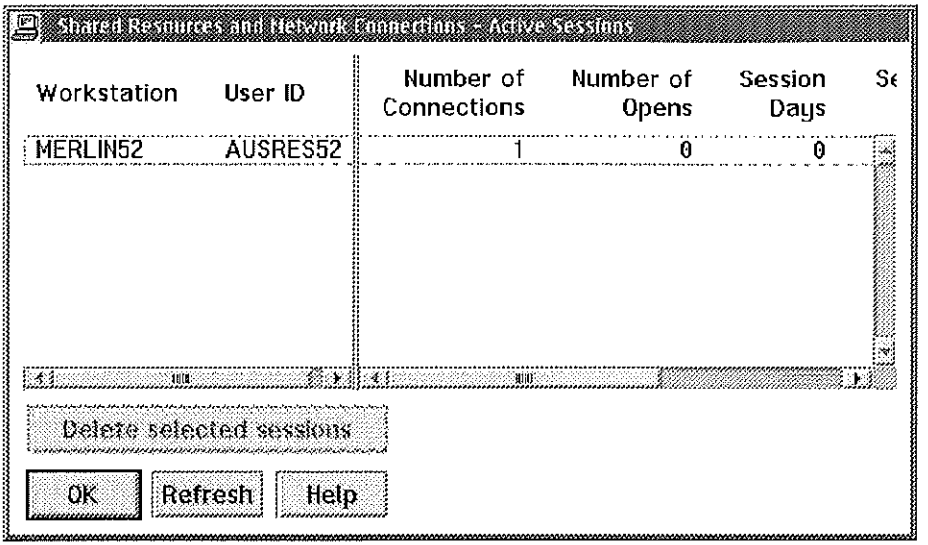


Figure 219. Active Sessions Information

This dialog shows the computer name and user ID for each network user, as well as the number of resource connections, open files and so on. If you wish, you can delete a session, forcing that user to log off and terminating any connections. You might want to do this if a user has gone home for the day and left his/her connections active, thereby preventing other users from accessing your resources.

5.5.9 Configuring Peer Services

The Shared Resources and Network Connections notebook includes a Configuration tab, which allows you to view and change some of the configuration values for the network transport protocols associated with Peer Services services on your OS/2 Warp 4 system. This tab contains two pages, the first of which is shown in Figure 220 on page 410.

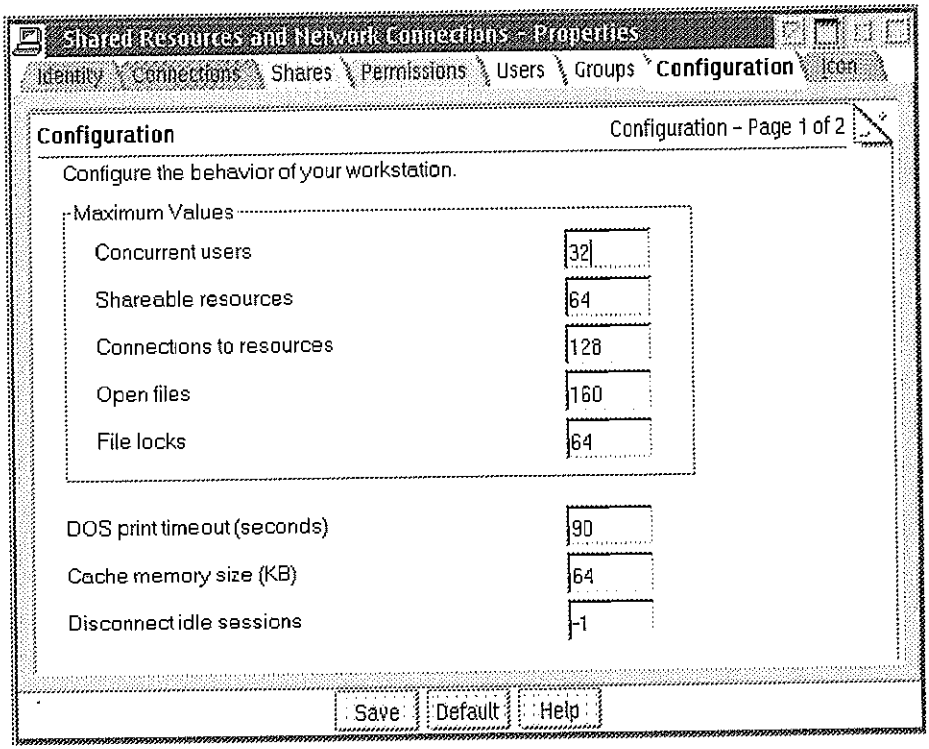


Figure 220. Configuration Page 1/2

This page allows you to define the maximum number of users that may concurrently access your resources, the maximum number of resources you may concurrently share, and the maximum number of connections that users may open to your resources. Note that this is not necessarily the same as the number of users, since each user may access more than one resource at the same time. The default values should be sufficient for most situations, and you should only alter these values if you encounter problems sharing your resources, or if users have trouble accessing them.

The second Configuration page allows you to view or change parameters that are associated with network transfer buffers and serial devices on your workstation, as shown in Figure 221 on page 411.

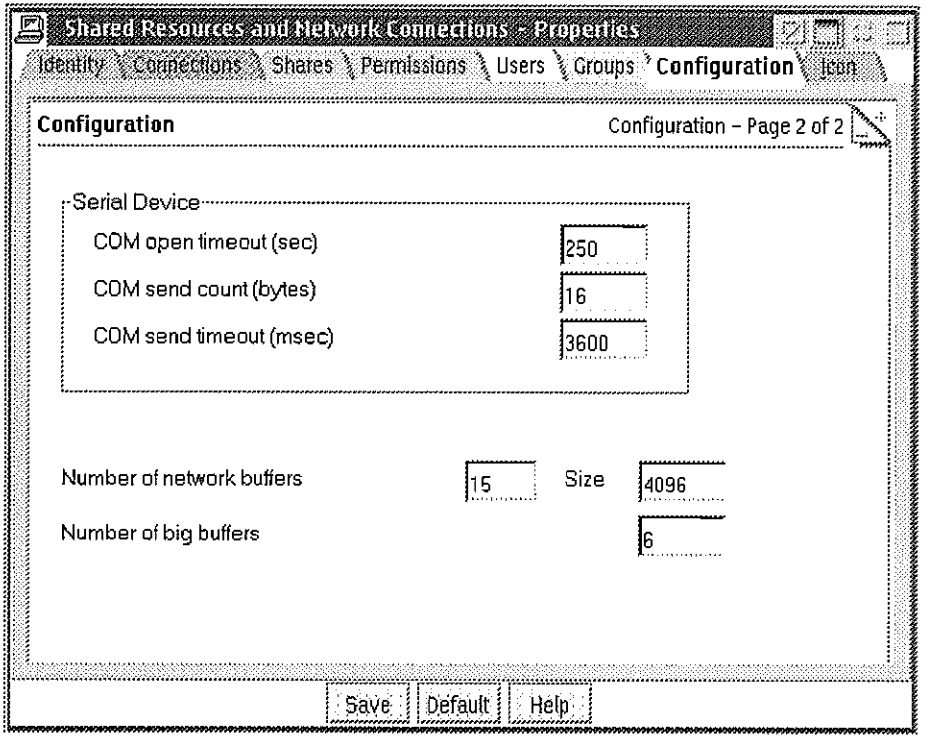


Figure 221. Configuration Page 2/2

Under normal circumstances, there is no need to change these parameters. You should accept the default values unless instructed to change them by your network administrator or a qualified support person.

Warning!

In order to save any configuration parameters after you change them, you must select the **Save** for *each* of the pages. This will cause the new values to be saved in your IBMLAN.INI file. The notebook *does not* save the changes automatically.

For more information about tuning Peer Services, you should refer to the online documentation for the File and Print Client.

5.6 Mobile Office

If you use OS/2 Warp 4 on a LAN at the office, but often work at home or take your computer on the road, you will sooner or later encounter a situation where data files or documents on your OS/2 Warp 4 system are different from files on your server, or where you update a file on the road and forget to copy it back to your server when you return to the office. This is where OS/2 Warp 4's Mobile Office Services can help you.

Mobile Office Services is an extension to OS/2 Warp 4's file system that allows you to physically disconnect from your LAN, yet still have access to your server files, and is based on the Mobile File Synchronization (MFS) component of OS/2 Warp 4.

Using MFS, you can disconnect from a server, yet still read or modify existing files, create new files and directories, or delete existing files. When you reconnect to the server, the server is automatically updated with any new or added files or directories. If files have changed on the server since you last connected, such changes are detected by MFS and help is provided to resolve any possible conflicts. You have the choice of keeping the server copy, replacing it with the changed version from your OS/2 Warp 4 system, or keeping both and renaming your own copy. For ASCII files, MFS provides additional extensive conflict detection and resolution of any files changed on both your OS/2 Warp 4 system and the server.

In order for you to run Mobile Office Services successfully, the Remote Access Client or the Novell NetWare Client must be installed and running on your OS/2 Warp 4. With these clients, the following servers are supported:

- IBM Warp Server and IBM LAN Server 4.0
- Peer Services from IBM Warp Connect or OS/2 Warp 4
- Novell NetWare Server 4.1 (and above) with NetWare Directory Services (NDS)
- Microsoft Windows NT Server
- Microsoft Windows 95

Mobile Office Services is installed and resides solely on your own OS/2 Warp 4 system. It does not require any changes to the server, since all operations are initiated and controlled from your system. In Figure 222 on page 413, an IBM ThinkPad laptop system is used to show how MFS stores files from a server, operates while disconnected, and updates server files upon reconnection.

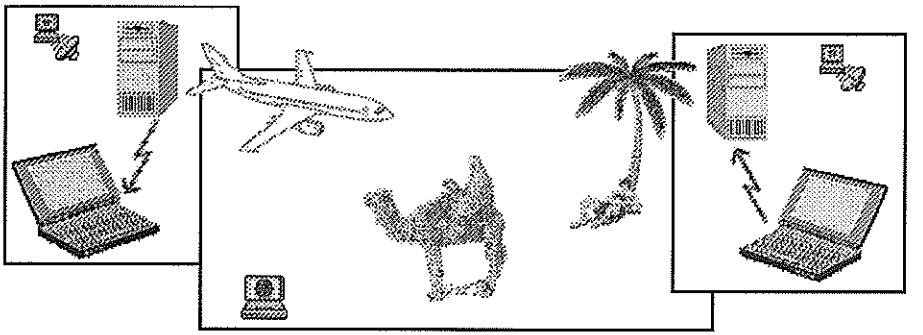


Figure 222. Mobile Office Services Overview

In this example, assume that you access files on the server, before disconnecting from the LAN and going on an airplane journey (presumably to somewhere with a warm climate). You can work with the files while you are away, and they can appear with the same drive, path and file name as when you accessed them directly from the server (you can use a different drive letter if you wish). For example, if you normally have a network drive V: on your server, any files you access through MFS when disconnected from your LAN will still use V: as their drive letter.

When you reconnect to your LAN and access the server, MFS compares the files on your system with those on the server. Any updates are copied back to the server, and if MFS detects that the files on the server were updated while you were away, it will prompt you to decide what should be done.

5.6.1 Using Mobile Office Services

Mobile Office Services is ready for use as soon as it is installed. There are some configuration options that you can use if you wish (see 5.6.2, "Configuring Mobile Office Services" on page 422), but you do not need to do anything in order to use Mobile Office Services.

To use Mobile Office Services, click on **Connections** on your Workplace Shell desktop, then on **Network=> Network Services=> Mobile Office Services**. The Mobile Office Services folder is shown in Figure 223 on page 414.

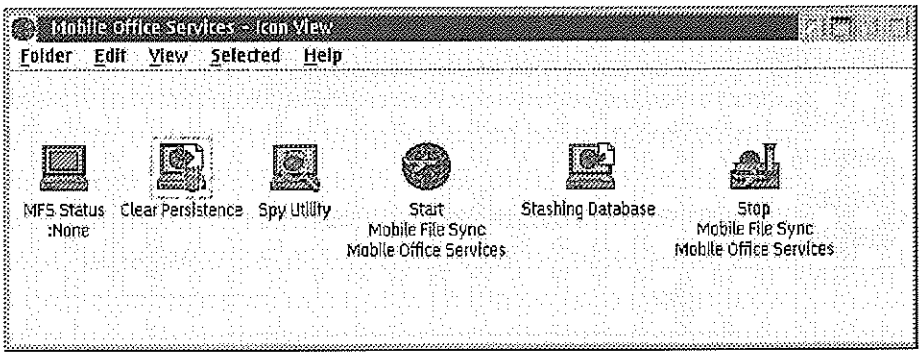


Figure 223. Mobile Office Services Folder

When your OS/2 Warp 4 system is connected to a server, and you start Mobile Office Services by double-clicking your left mouse button on the **Start MFS** object, MFS detects which server-based files and directories you are accessing, and stores them on your local hard disk. This is known as *caching*. The cached files can be read or updated, and new files can be created. You can list the contents of cached directories, create new directories or delete existing directories.

There are three different forms of caching available in MFS:

- The *implicit caching* of files in the background, without manual intervention. This is the default.
- An intelligent caching tool named the *Spy Utility*.
- An explicit caching tool, known as the *Stashing Database Editor*, with which you can manually select files and directories to be cached. The process of selecting files and directories is called *stashing*.

Mobile Office Services keeps track of all updates on the client by recording them in a client-modification log. All updates are propagated to the server whenever a new connection is established. This process is known as *reintegration*.

The list of server files that you have used and the NET USE statements that access your server are maintained from one session to the next. This set of data, along with the actual cached files, is known as *persistence*. The Clear Persistence utility clears this information when you are ready to begin another project or attach to a different server. The current implementation of Mobile Office Services is restricted to caching files from a single shared resource, that is, server connection. If you wish to cache files from a different server, you must first stop MFS, and then clear persistent storage. You can then restart MFS and attach to a different server.

The Stop Mobile Office Services utility allows you to shut down the MFS remote file system. Before you stop MFS, you should ensure that all file transfers are complete

(that is, no files are being copied to or from the MFS drive letter). If file activity is in progress during the shutdown, files may be incomplete or corrupted when MFS is restarted. If you are performing a normal OS/2 Warp 4 shutdown process, you *do not* need to explicitly shut down MFS.

5.6.1.1 Using Implicit Caching

As a user of Mobile Office Services you automatically gain the benefits of implicit caching. No specific action is required by you to activate implicit caching.

As with most communications software, MFS maps a network drive resource to a local drive letter. The first time your client is connected to the server after starting Mobile Office Services, you specify the server drive to be used and the local drive to which it is mapped by means of the Get Drive and Network ID window, as shown in Figure 224.

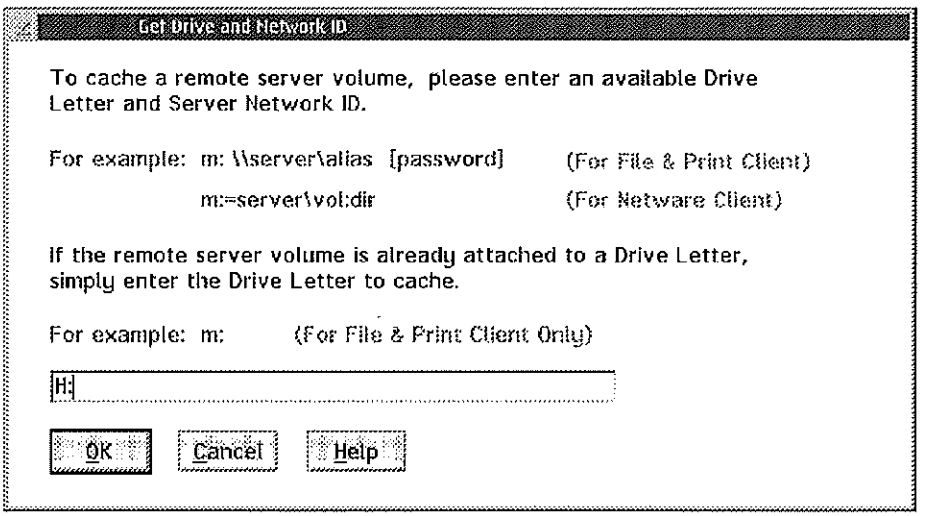


Figure 224. Initial Caching of a Remote Server Volume

This window allows you to associate MFS with a particular drive letter and file server. You can use an unallocated drive letter on your system, or a drive letter that is already attached to a file server using software such as the File and Print Client or Novell NetWare Client. If you specify a free (unallocated) drive letter, you must also supply the network ID of the server so that MFS attaches to the server on your behalf. If you enter the drive letter that is currently allocated to a network drive, you do not need to enter the network ID of the server. MFS will simply cache the specified network drive for you.

Assume you are accessing an IBM Warp Server system named SRV1, and want to map the network resource named LOTUS on server SRV1 to your local H drive for caching

using MFS. You would enter the following information in the Get Drive and Network ID window:

```
H: \\SRV1\LOTUS
```

You can now access files and directories on the H: drive for reading or updating. All files and directories that you access are automatically cached on your own system.

Additional *directory caching* occurs every time you access a directory on the server. For example, when you use the DIR command to list the directory's contents, that listing is cached on your system. The directory may contain files or additional subdirectories. Only the names (and related information such as sizes) of those files and subdirectories, not their contents, are cached onto the client. The integrated *file caching* caches a file onto your system *only* when you open it with an application such as an editor or word processor.

After files and directories are cached, all access requests are satisfied using the cached copy. Internal logic within MFS guarantees that you will always access the latest data. File updates are performed against the cached copy rather than at the server, thereby reducing network traffic. As soon as a file is closed, all updates are immediately propagated to the server.

5.6.1.2 Working with the Stashing Database

To work with the Stashing Database Editor, simply double-click your left mouse button to start the program from the Mobile Office Services folder. The Stashing Database Editor will display a window like that shown in Figure 225.

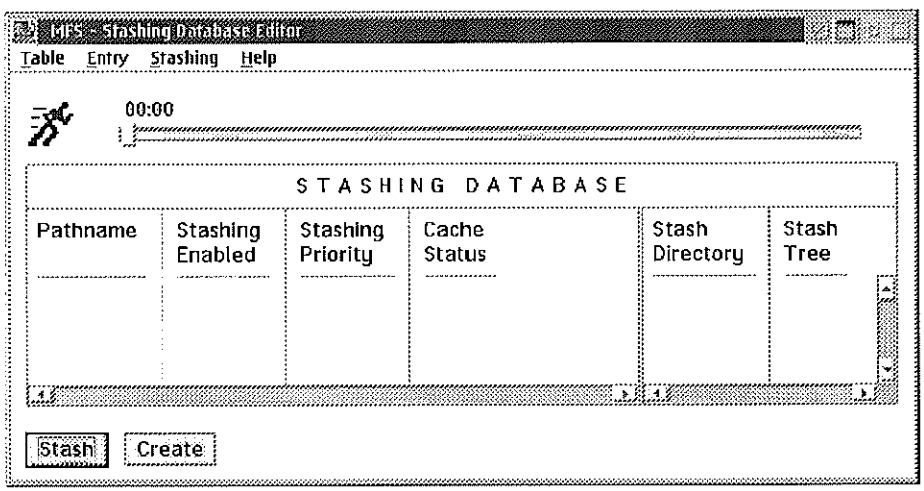


Figure 225. Stashing Database Editor

Implicit caching automatically copies server files to your system as you access them, but in some cases, you may need to cache files that you have not yet accessed. The Stashing Database Editor allows you to explicitly cache files, directories, or entire subdirectory trees from the server to your own system. You can use the stashing technique to ensure that required files exist on your system before you disconnect from the server.

The Stashing Database Editor allows you to create, copy, modify or delete entries in the stashing database using the items on the menu bar. Each entry may also be individually disabled or re-enabled by double-clicking your left mouse button on its entry in the list. You can create and save profiles, allowing you to populate the stashing database with all the files required by a particular application.

To create a new entry for the stashing database, select the **Create** button to show the Creating a Stashing Database Entry window, as shown in Figure 226.

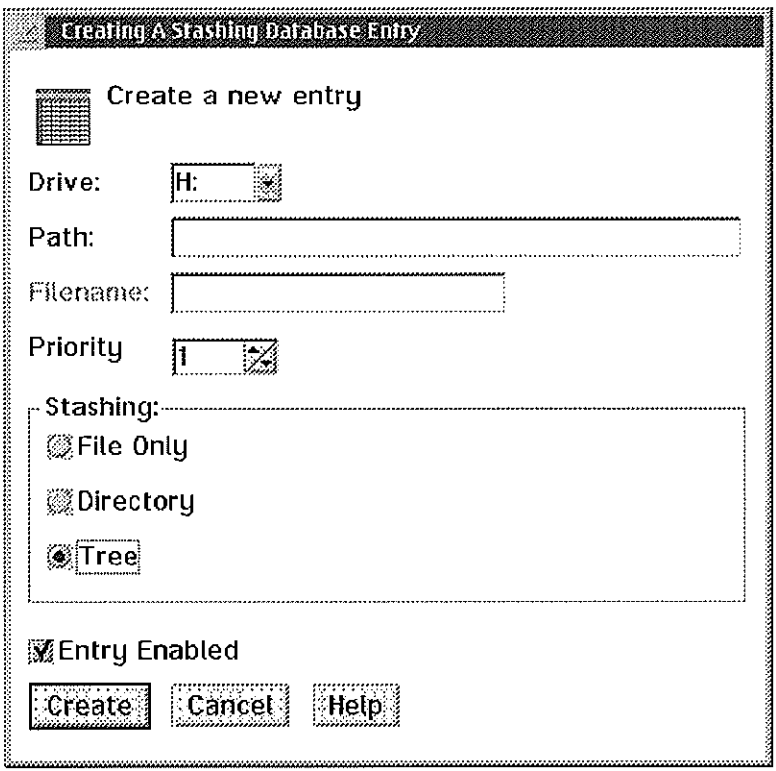


Figure 226. Creating a Stashing Database Entry

This window allows you to define complete files, directories and even entire directory trees to be cached to your local drive, provided you have sufficient free disk space. Because cache space is limited, a priority algorithm is provided to decide which files remain in the cache and which files are discarded. You can use the Priority field to specify a priority entry in the stashing database. If the cache becomes full during a stashing operation, a cache replacement policy is used to discard lower-priority files first, keeping higher-priority files in the cache.

See 5.6.2.1, "Altering Your Cache Size and Location" on page 422 for other ways that you can manage the amount of space and the number of entries in the cache.

After creating your required entries in the stashing database, you must initiate the stashing operation by selecting the **Stash** button as shown in Figure 225 on page 416. The stashing operation puts stashing-database entries into the cache.

The progress indicator in the Stashing Database Editor window monitors the progress of a stash operation initiated by selecting the **Stash** menu item or the **Stash** button. The progress indicator shows that a stash is in progress, and the accompanying timer shows the elapsed time in hours, minutes and seconds since stashing began.

You can disconnect from the server once the stashing operation is complete, and all required files have been cached to your local hard disk. This function is most useful just before a voluntary MFS disconnection, in order to ensure that all required files have been cached.

5.6.1.3 Working with the Spy Utility

The Spy Utility is located in the Mobile Office Services folder. When enabled, it monitors your MFS file accesses and draws conclusions about the files and program modules that belong to particular applications. It groups these files into collections known as *bookends*, which you can then store in the stashing database. This allows you to ensure that all the files required to use a particular application and access a set of data files are cached by MFS for disconnected operation.

A bookend is a named profile that represents all of the files that are needed to complete a task. You can create different bookends for particular applications (such as checking the spelling of a document or compiling a program), or you might create a bookend for a dynamic link library or a font library. Bookends are stored in a *spy database* and you can insert them into the stashing database, where you can assign a priority to them so that they remain in the cache, even when the cache becomes full.

When you start the Spy Utility, it displays the Spying Control window as shown in Figure 227 on page 419.

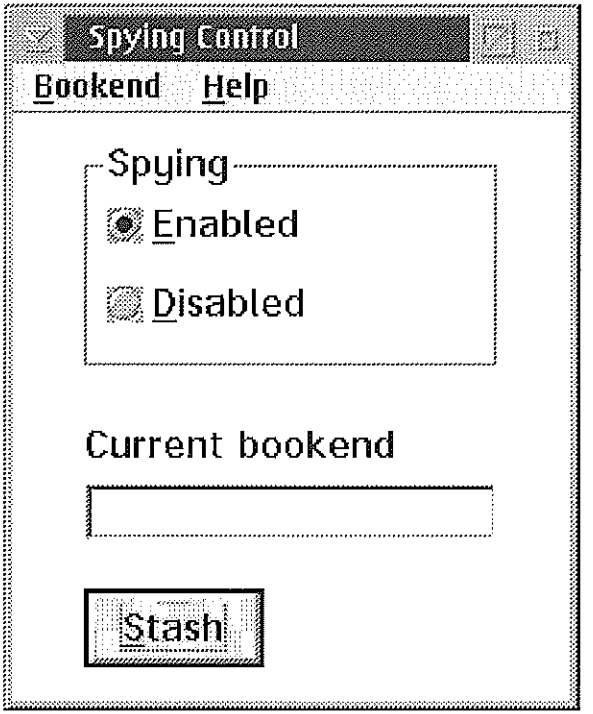


Figure 227. Spying Control Window

Before you can enable the Spy Utility, you must provide a name for the bookend in which the utility will store its information. To do this, select the **Bookend** menu bar item, and select **Open** from the resulting pull-down menu. The Spy Utility will display the Open Bookend window as shown in Figure 228 on page 420.

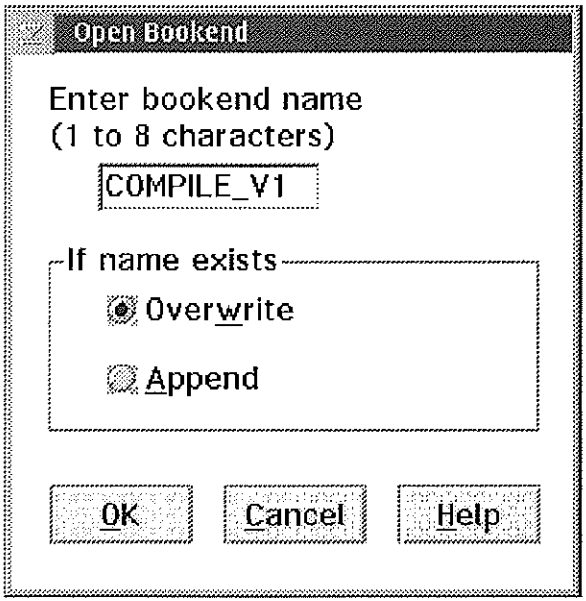


Figure 228. Bookend Definition

After you have defined a bookend, you can enable the Spy Utility by selecting the **Enabled** radio button in the Spying Control window. The Spy Utility will now observe all of your MFS file accesses and build a bookend for the relevant files and directories.

When you have finished working with the programs you require, you can disable the Spy Utility by selecting the **Disabled** push button. The Spying Control window will remain open, but the Spy Utility will no longer analyze your file accesses.

You can now instruct the Spy Utility to analyze its log of information and create a spy database of the applications and files you accessed. To do this, select the **Stash** button from the Spying Control window.

After the log is analyzed, the Stashing Selection window appears. This window displays the entire database built by the Spy Utility, divided into four columns:

- Bookends that you defined within the Spy Utility.
- Programs that were executed while the Spy Utility was enabled.
- "Orphan" files that were accessed, but could not be associated with any particular application. This situation most often occurs when you access files on drives not being cached with MFS.
- Additional files that you may choose to include in the list, regardless of whether those files were accessed or not.

You can select bookends, programs or files from any of the four columns, for inclusion in the stashing database. These items will then be automatically cached on your local hard disk whenever you perform a stash operation.

Since the Spy Utility records all MFS activity when enabled, it can analyze multiple executions of the same program. This is a significant advantage at disconnection time since, rather than being dependent on a single "typical" execution of a program to define the set of required files, the Spy Utility can use its observation of multiple executions to make a more informed choice about which files to cache.

5.6.1.4 Disconnected Operation

When you disconnect from the server, you will still have access to cached data on the drive that you specified when starting MFS. You can access this drive just like any other local drive. For example, you can open and update existing files, create new files, or delete existing ones. All operations that change data in files or that change the file system structure for the drive are saved in the client-modification log. These operations are then propagated to the server when a connection is reestablished.

5.6.1.5 Reconnecting to Your Server - Reintegration

The reintegration process starts when MFS detects that you have reestablished a connection to the server. If you are using the cached drive, MFS displays a message asking you to discontinue using the drive. When the drive is free, all updates you made on your system while you were disconnected are propagated to the server. During reintegration, a pop-up window displays the names of the updated files and directories as they are being reintegrated with the server.

If any of the changes you made while disconnected conflict with the version on the server, an MFS Conflict window pops up and provides you with a number of choices to resolve the conflict. A conflict normally occurs if you make changes in a file while you are disconnected, and meanwhile someone else has updated the file on the server. When you come to reintegrate your changes with the server, MFS detects that the server copy has changed and signals a conflict.

There are two categories of conflict:

- A *name conflict* occurs when you create a file or directory while disconnected and, at reintegration time, a file or directory with the same name exists on the server. You can resolve name conflicts in one of three ways:
  - You may discard the file or directory on your system, keeping the one on the server
  - You may rename the file or directory on your system, thereby resolving the conflict
  - You may replace the conflicting file or directory on the server with the one on your system

- A data conflict occurs when you update a file on your system while disconnected and, at reintegration time, MFS detects that the file on the server was also updated while you were disconnected. You can resolve data conflicts in the following ways:
  - You may append the modified file on your system to the file on the server.
  - You may discard the version of the file on your system.
  - For an ASCII file, you may view the differences between the client and the server using a graphical interface provided by MFS, and edit the two files to create a composite file on both your system and the server.
  - You may rename the file on your system, keeping both files and thereby resolving the conflict.
  - You may replace the file on the server with the new file created on your system.

These choices are provided by MFS for each file or directory on your system that conflicts with a file or directory on the server. When all updates have been propagated to the server and reintegrated, you can continue using the cached drive.

5.6.1.6 Accessing a Different Server

If you wish to cache files from a different server, you must follow these steps:

1. Stop Mobile Office Services by double-clicking your left mouse button on the **Stop Mobile Office Services** object. Make sure that all file activity for the cached drive is complete before you stop MFS.
2. Clear the persistence data for the cached drive by double-clicking your left mouse button on the **Clear Persistent Storage** object.

   MFS keeps track of cached server files and directories by storing their data on your system. This data is retained while you are disconnected. In order to connect to a different server, you must clear this data so that MFS can create new data for cached drive on the new server.

You can now restart MFS and connect to a different server.

You must carry out these steps because the current implementation of Mobile Office Services is restricted to caching files from a single shared network resource.

5.6.2 Configuring Mobile Office Services

Although Mobile Office Services is ready to use after initial installation, there are a number of configuration and tuning options that you may want to consider. These are not normally required, but may be useful if you are working with large amounts of cached data, or you have a very large network with high amounts of data traffic.

5.6.2.1 Altering Your Cache Size and Location

MFS allows you to set limits on the amount of disk space that it can use for caching files, and on the number of files that it can cache. These limits are set with environment variables in your OS/2 Warp 4 CONFIG.SYS file:

- MFSCACHE determines the local drive on which the cache resides; this is known as the *cache drive*. For example, if the CONFIG.SYS file has the following line, the cache drive is D:

  ```
  MFSCACHE=D:\MFS\CACHE
  ```

- MFSCACHESIZE sets an upper limit on the disk space that MFS can use for caching. This is specified as a percentage of the free space available on the cache drive, and can be in the range of 10%-50% of the free space on the cache drive.

  MFSCACHESIZE is defined in the CONFIG.SYS file as follows:

  ```
  MFSCACHESIZE=x
  ```

  where x can be any integer in the range of 10 to 50. If MFSCACHESIZE is not defined in the CONFIG.SYS file, a default value of 10 is used.

- **MFSMAXFILES** sets a limit on the number of files that can be cached by MFS. MFSMAXFILES is defined in the CONFIG.SYS file as follows:

  ```
  MFSMAXFILES=x
  ```

  where x is any integer in the range of 1,024 to 65,536. If MFSMAXFILES is not defined in the CONFIG.SYS file, it defaults to 1,024.

If you often work with large amounts of cached data and you find you are running out of cache space, you can alter the settings for these environment variables to provide additional cache space.

5.6.2.2 Setting Communication Timeout Values

To determine whether a connection to the server is available, MFS periodically sends a "heartbeat" call to the server. If a response is not received within a specific period of time, MFS assumes that no connection is available and operates as though you were disconnected.

Networks vary considerably in their capacity and speed. When you connect to a server via a modem, the information transfer rate is typically measured in tenths of kilobytes per second. If the connection is through a high-speed LAN, the transmission rate is in megabytes per second. You may connect your system to a server using a LAN at the office and using a modem at home. To accommodate this difference in network speeds, MFS includes a built-in dynamic timeout mechanism. When you start MFS, it attempts to detect a connection. A timeout value is then set by using the server's initial response time.

MFS uses a dynamic timeout strategy. Low-level file-system requests that can be completed in 15 to 60 seconds are handled automatically. Note that the transfer of a large file may take several minutes over a telephone line, and the connection will not time out. This is because the transfer is actually composed of many consecutive smaller-sized reads or writes, and the timeout value applies to each individual read or write packet. The strategy also compensates for times when network traffic is very high

and response is slow, and dynamically adjusts to the response speed of various communications media.

You can override dynamic timeout management if your file system requests are expected to be less than the minimum value of 15 seconds or longer than the maximum value of 60 seconds. The minimum and maximum values can be specified in your OS/2 Warp 4 CONFIG.SYS file as follows:

```
MFSMINTIMEOUT=x
MFSMAXTIMEOUT=y
```

where x is the minimum number of seconds before timeout occurs and y is the maximum number of seconds before timeout occurs.

One or both values may be specified. The values for x and y must be an integer between 1 and 65,536. These integers may have different values, but the value for MFSMINTIMEOUT must be less than or equal to the value for MFSMAXTIMEOUT.

5.7 Systems Management

In many larger network environments, the network and the systems on the network are managed from a central point, in order to maintain the best possible performance and reliability. OS/2 Warp 4 includes utilities that will enable your OS/2 Warp 4 system to be managed by a system administrator using a number of different industry-standard tools and protocols.

Systems management across a network is, by definition, a client/server application. The system administrator doing the management uses a suite of systems management tools on a systems management server, and the systems being managed run agents or clients that report information to the server and implement commands from the server.

OS/2 Warp 4 includes two such clients:

- The **SystemView Agent for OS/2** allows a system administrator to access and manage information consistently and seamlessly across the network, either locally or remotely. The administrator can track errors resulting from software and hardware on users' systems, simplifying technical support and trouble-shooting.
- **TME 10 NetFinity** allows a system administrator to easily view, initiate and use management and configuration services. The administrator can view hardware and software configurations, monitor the usage and performance of critical components such as processors, memory and disk drives, and anticipate potential problems before they occur.

These clients are known collectively as the **System Management Client**.

In this book, we will cover only the functions built into OS/2 Warp 4 itself. Many of the capabilities of SystemView and TME 10 NetFinity apply only to server systems.

OS/2 Warp 4 includes a number of serviceability tools that make it easier to diagnose problems with applications or with OS/2 Warp 4 itself. You will find a range of utilities as First Failure Service Technology (FFST) probes, event tracepoints, process dumps and system dumps. These utilities are briefly explained in this chapter.

5.7.1 Installing Systems Management Components

You will normally install the System Management Client during OS/2 Warp 4 installation, as described in 5.1, "Installing OS/2 Warp 4 Network Components" on page 262. After you have installed OS/2 Warp 4, you will find the following Systems Management components in the Utilities folder within the Programs folder on your Workplace Shell desktop:

- **SystemView Agent System Management Agent**

  The SystemView Agent for OS/2 allows your OS/2 Warp 4 system to be managed using systems management tools that conform to the Simple Network Management Protocol (SNMP) or the Desktop Management Taskforce's Desktop Management Interface (DMI) Version 1.1. These protocols are de facto standards that are supported by multiple vendors.

  The SystemView Agent for OS/2 will be installed on your OS/2 Warp 4, regardless of whether you decide to install the System Management Client or not. The agent provides small client code that you can configure after installation for communication with other SNMP or DMI systems management central sites.

- **TME 10 NetFinity System Management Client**

  The TME 10 NetFinity client is configured during OS/2 Warp 4 installation, as described in 5.1, "Installing OS/2 Warp 4 Network Components" on page 262. The client includes some local systems management functions that you can run on your OS/2 Warp 4 system; we will describe these in 5.7.3, "Using TME 10 NetFinity" on page 430.

- **Serviceability Tools**

  The serviceability tools are installed by default when you install OS/2 Warp 4. They are *not* represented by objects in the Workplace Shell; instead you normally use them from a command line. See Chapter 10, "Recovery" on page 773 for more details.

5.7.2 SystemView Agent for OS/2

The SystemView Agent for OS/2 provides access to system components that have been defined according to either of the following protocols:

- Desktop Management Interface (DMI)
- Simple Network Management Protocol (SNMP) Distributed Protocol Interface (DPI)

The SystemView Agent for OS/2 also provides a native SNMP agent for interaction with SNMP-based management systems such as Hewlett-Packard's OpenView.

The operation of the SystemView Agent is shown in Figure 229 on page 426.

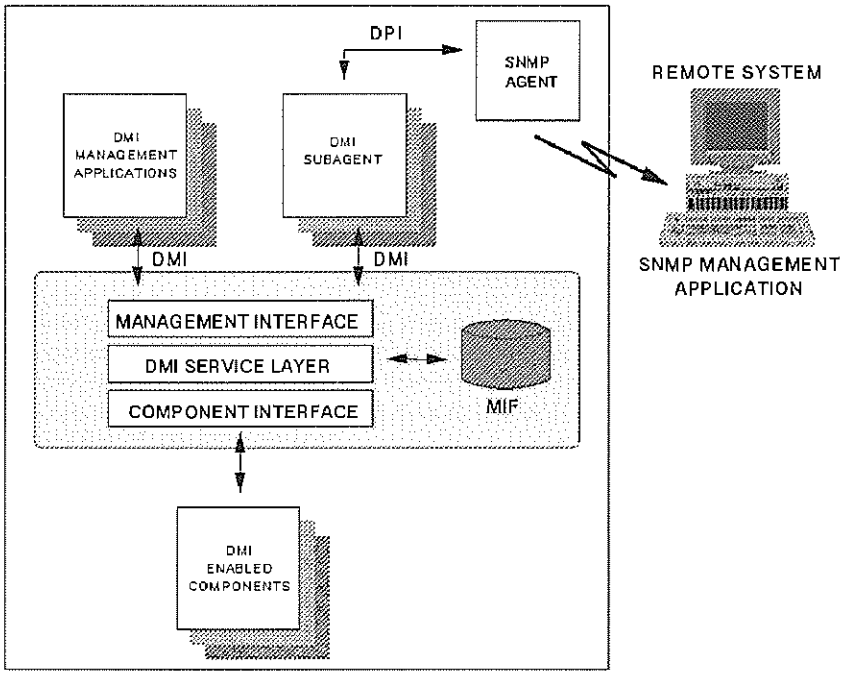


Figure 229. SystemView Agent for OS/2

The SystemView agent provides both an SNMP agent and a DMI subagent, allowing your OS/2 Warp 4 system to be managed by any systems management tools that conform to either the SNMP or DMI protocol. The SystemView agent holds information internally in DMI Management Information Format (MIF), and translates it to the SNMP format as required to service requests or implement commands from SNMP management tools.

The following sections of this chapter will show you how to configure your SNMP agent, start the agent package and use the DMI MIF Browser utility. For detailed information on configuring and using all of the SystemView Agent for OS/2 functions, you should refer to the SystemView Agent for OS/2 online documentation.

5.7.2.1 Configuring SNMP

After installing OS/2 Warp 4, you must provide additional information to configure the SystemView Agent, by starting the **OS/2 Agent Configuration** object.

CID Installation

The installation of the SystemView Agent for OS/2 is completely CID-enabled. This means that it can be distributed to numbers of workstations in a large networking environment without administrative interaction. See the SystemView Agent for OS/2 online documentation for parameters.

The information required to configure the SystemView Agent must be provided by your system administrator.

5.7.2.2 Using SNMP

The SNMP agent built into OS/2 Warp 4 is normally used by a system administrator to obtain information from your OS/2 Warp 4 system, and execute commands on your system. An administrator can query a set of variables on your system, known as a Management Information Base (MIB). The MIB is set up in a standard format that allows any management tool to issue a query and receive a reply from the SNMP agent. You or your system administrator can also configure the agent to send notifications of significant events (such as system errors, or your hard disk becoming nearly full) to a management tool on another system. These notifications are known as *traps*.

In addition to the SNMP agent, the SystemView Agent for OS/2 also provides a set of SNMP utilities that you can run on your OS/2 Warp 4 system, to obtain network status information. With these utilities, you can:

- Verify your setup
- Display groups and tables of management information
- Display and set individual management information variables
- Display traps received from SNMP agents

You can view SNMP traps on your OS/2 Warp 4 system using the SNMP Trap Monitor. The monitor displays SNMP traps that are sent to your system by SNMP agents running on other systems. These SNMP agents must be configured to make your system a destination for SNMP trap information. To monitor your network for traps and view them as they occur, click on the **Programs** folder on your desktop, then on the **SystemView Agent System Management Agent** folder, **Utilities** and **SNMPTRAP**. You can also log trap information to a file for future reference.

The remainder of the tasks that you can perform through the SystemView Agent for OS/2 are somewhat beyond the scope of this book. See the online documentation for information on the commands and options available to perform these tasks.

5.7.2.3 Using the DMI MIF Browser

The DMI MIF Browser utility is a desktop tool that allows you to manage hardware and software products that conform to the DMI standard. These products or components register information with a DMI service layer, which stores the information in a standard format known as the Management Information Format (MIF). Components that register

information in this way include OS/2 Warp 4 and many of its components such as the Workplace Shell.

With the DMI MIF Browser, you can:

- Dynamically register and unregister with the DMI service layer
- Install and uninstall MIF files for different components in the service layer
- View events issued by the service layer
- View a hierarchical representation of the groups and attributes of each component MIF file that you have installed

When you start the DMI MIF Browser, it displays a graphical representation of the components (and their MIF files) that are currently installed on your system. These components are grouped by category, and are represented in the DMI MIF Browser window by icons, as shown in Figure 230.

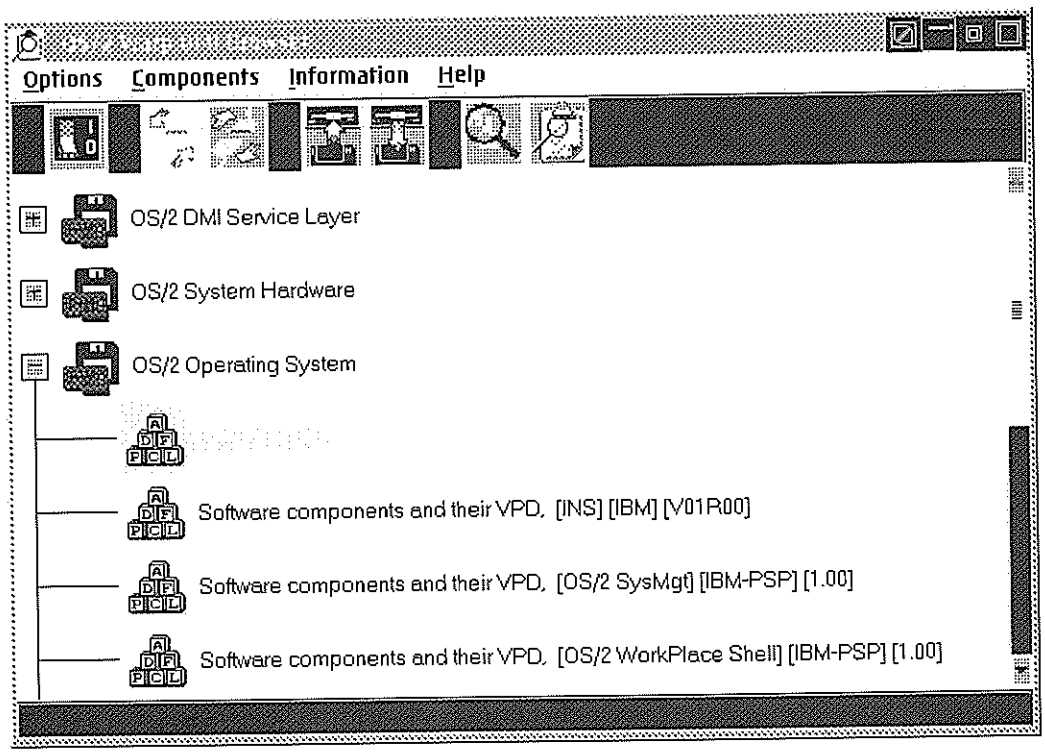


Figure 230. DMI MIF Browser - Component Hierarchy

To display the components within a group, click your left mouse button on the plus sign (+) to the left of the icon. The DMI MIF Browser will open up the hierarchy as shown in Figure 230.

To display information specific to a group, double-click your left mouse button on the group's icon. The DMI MIF Browser will display a dialog like that shown in Figure 231 on page 429.

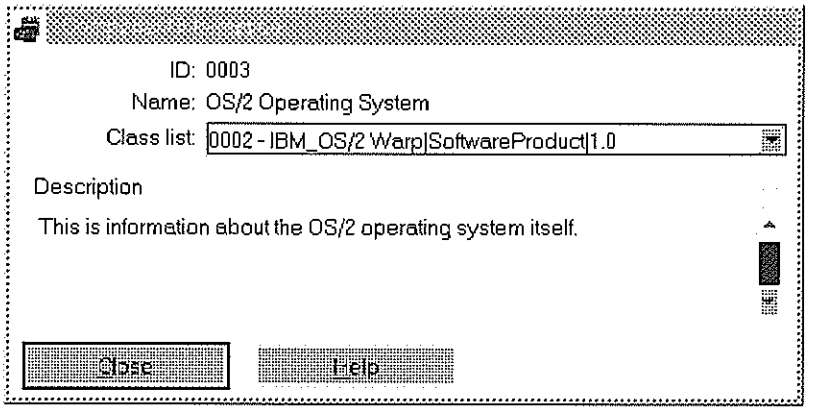


Figure 231. DMI MIF Browser - Component Details

You can access information on the attributes of each component by double-clicking your left mouse button information on the appropriate component icon.

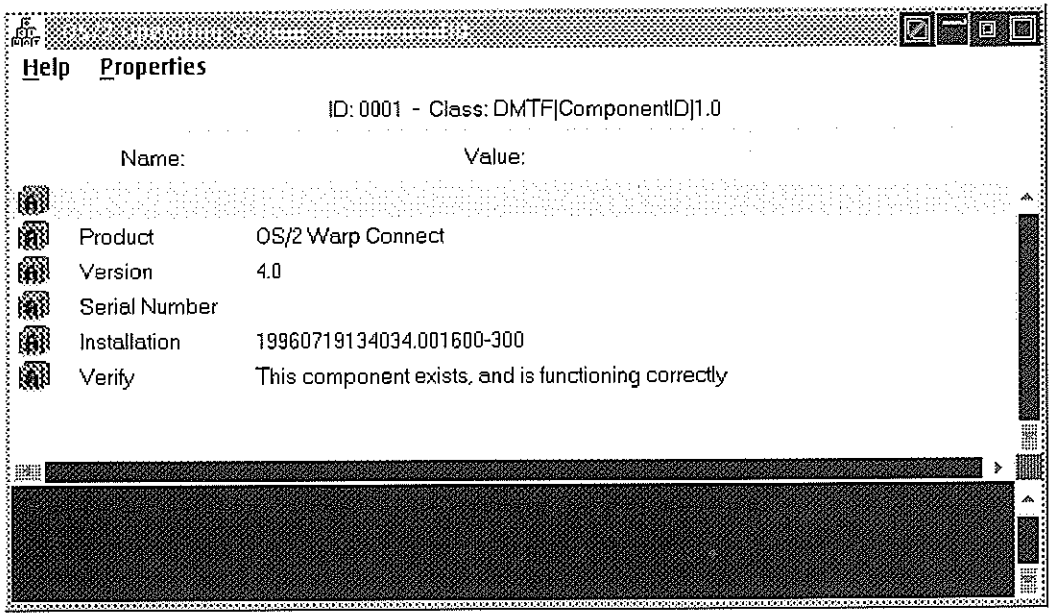


Figure 232. DMI MIF Browser - Component Attributes

There are other functions that you can perform within the DMI Browser, but these are beyond the scope of this book. For detailed information about these tasks, see the SystemView Agent for OS/2 online documentation.

5.7.3 Using TME 10 NetFinity

TME 10 NetFinity is a client/server systems management application, comprised of several components that are designed to work in tight conjunction with one another. These components are:

- The TME 10 NetFinity Network Interface
- The TME 10 NetFinity Client
- The TME 10 NetFinity Manager

These components work together as shown in Figure 233.

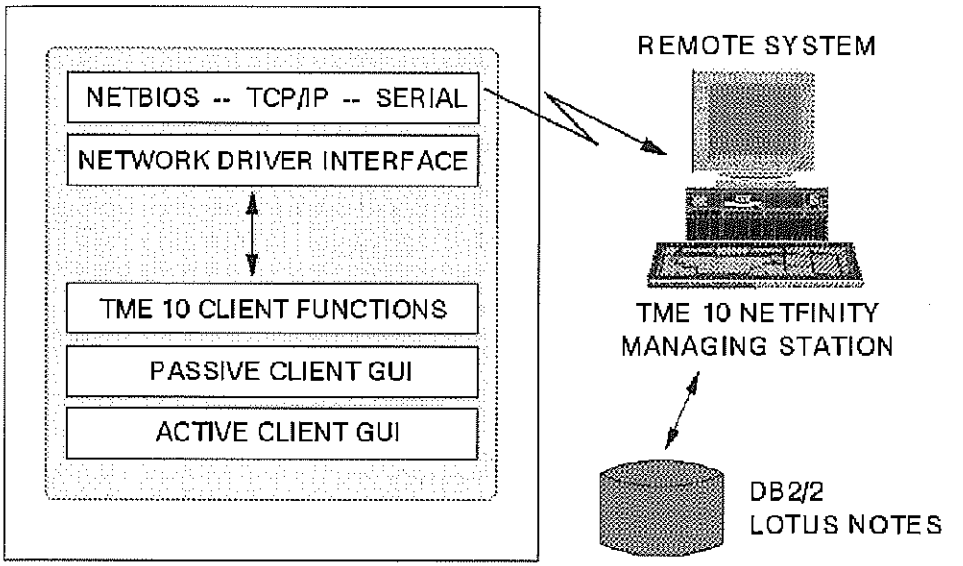


Figure 233. TME 10 NetFinity Components

The Network Driver Interface is a client module that enables your OS/2 Warp 4 system to be managed from another system on the network, using the TME 10 NetFinity Manager software. The TME 10 NetFinity Network Interface object is placed in your Startup folder when you install the System Management Client, and is automatically started when you boot OS/2 Warp 4, so that your system is recognized by a managing station as being an active network station, and can therefore be managed by that station.

If you intend to use TME 10 NetFinity for local management only, without having a network connection, you can stop the TME 10 NetFinity Network Interface task by closing it. If you wish, you can remove the object from your Startup folder to prevent it restarting when you reboot your OS/2 Warp 4 system. See 5.7.4, "Configuring the TME 10 NetFinity Network Driver Interface" on page 441.

The TME 10 NetFinity Client provides the means to access information collected about your OS/2 Warp 4 system through the TME 10 NetFinity Network Driver Interface. You can view details about your hardware and software, and monitor your system for performance.

There are two ways to set up your OS/2 Warp 4 system with TME 10 NetFinity in a network environment:

- **Passive Client**

In this mode of operation, a system administrator monitors a number of systems. There is no user interface to TME 10 NetFinity on the client systems, and TME 10 NetFinity facilities are therefore only available to an administrator on another system running TME 10 NetFinity Manager software.

- **Active Client**

  The active client mode gives an administrator the same access to your system as the passive client mode. In addition, it provides a user interface on each system so that you, as the user, can access the information provided by TME 10 NetFinity.

Default Installation Setup

By default, OS/2 Warp 4 will install the TME 10 NetFinity Active Client on your OS/2 Warp 4 system, which will enable you to alter the configuration of TME 10 NetFinity on your system. If you are a system administrator and you do not wish your users to have access to such facilities, you must remove the TME 10 NetFinity Service Manager object from the Workplace Shell, or use a CID-based remote installation with a response file to install the passive client only.

The TME 10 NetFinity Manager is separate product from IBM, and is *not* provided with OS/2 Warp 4. The TME 10 NetFinity Manager is normally installed on a separate system, to monitor and manage all the TME 10 NetFinity clients on the network. The TME 10 NetFinity Manager software is provided as part of IBM Warp Server, to provide basic systems management services.

5.7.3.1 Using the TME 10 NetFinity Client

The TME 10 NetFinity Active Client allows you to view the information collected on your system by the TME 10 NetFinity Network Driver Interface. When you start the TME 10 NetFinity Service Manager, it will display a selection of functions as shown in Figure 234.

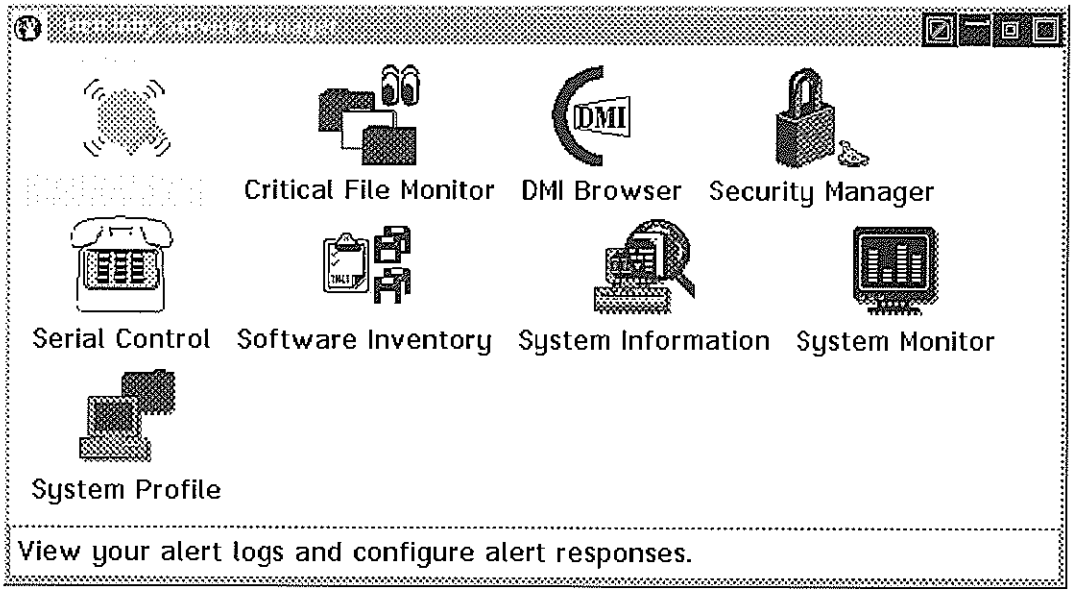


Figure 234. TME 10 NetFinity Service Manager

Note that the available functions may differ from those shown in Figure 234 on page 432, depending on the capabilities of your computer. For example, there are three possible services missing from the folder shown in Figure 234 on page 432:

- **System Partition Access**, which appears only if your system has a system partition on its hard disk
- **ECC Memory Setup**, which appears only if your computer has error checking and correcting (ECC) memory installed
- **Predictive Failure Analysis**, which appears only if your computer's hard disk is capable of such analysis.

The lack of these functions in many OS/2 Warp 4 systems should not cause undue problems, since they are primarily applicable to server systems and user workstations running critical applications. If your computer is capable of supporting these functions, they will appear in the NetFinity Service Manager folder and you will be able to use them.

The remaining items in the folder provide you with a wide variety of functions we will describe in the following section.

Alert Manager: The Alert Manager is an extendable facility that allows you to receive and process application-generated alerts. You can specify a variety of actions to be taken in response to alerts, including logging, pop-up notifications, forwarding the alert to another system, executing a program, or an application-defined action.

Starting the Alert Manager shows you an overview of the alert log as shown in Figure 235.

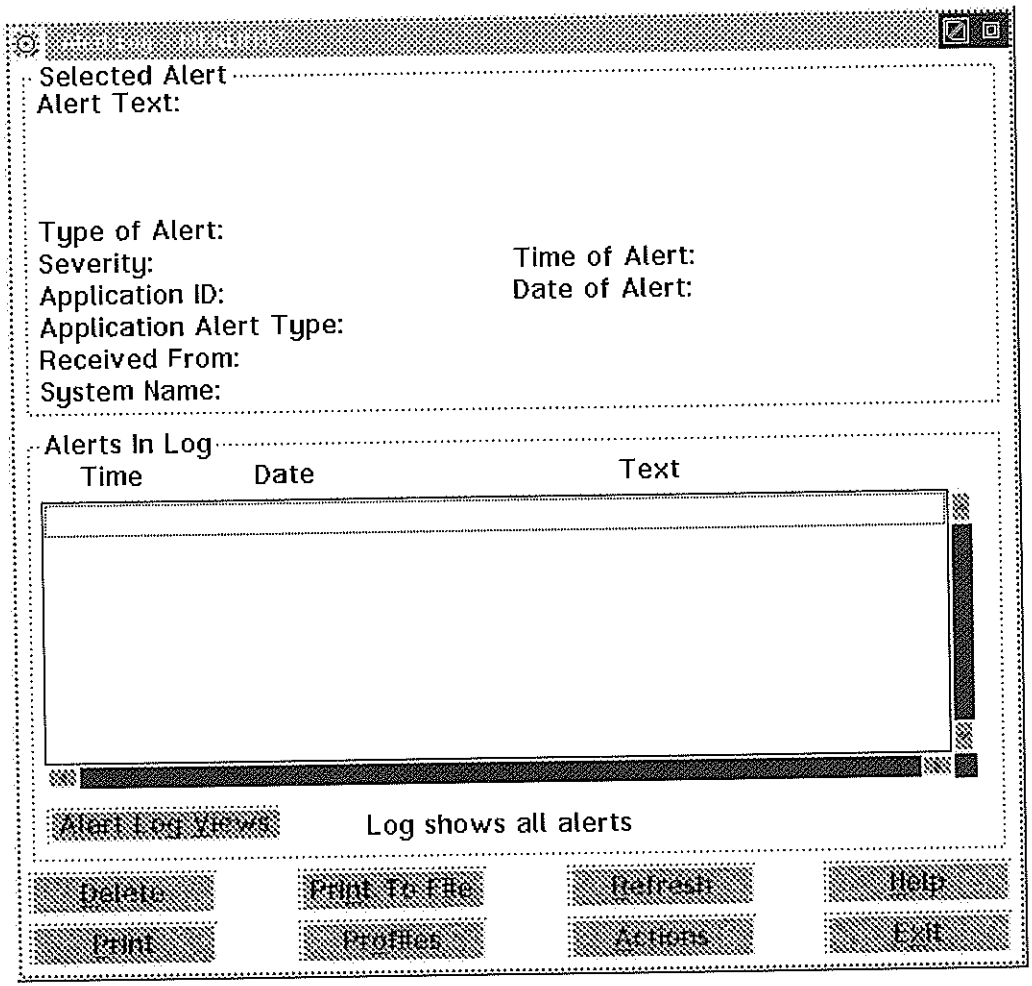


Figure 235. TME 10 NetFinity - Alert Manager

From this panel, you can configure the Alert Manager to perform all of the actions described above. See the online help for detailed instructions.

Critical File Monitor: The Critical File Monitor service warns you whenever critical system files on the systems in your network are deleted or altered. The Critical File Monitor service makes it simple for you to generate alerts when an important file (such as your CONFIG.SYS file) changes its date, time or size, is deleted (when it was

previously present), or created (when it was previously not present). The Critical File Monitor service can also be used to monitor any other files that reside on a system running the TME 10 NetFinity Client.

The user interface to the Critical File Monitor service is shown in Figure 236 on page 434.

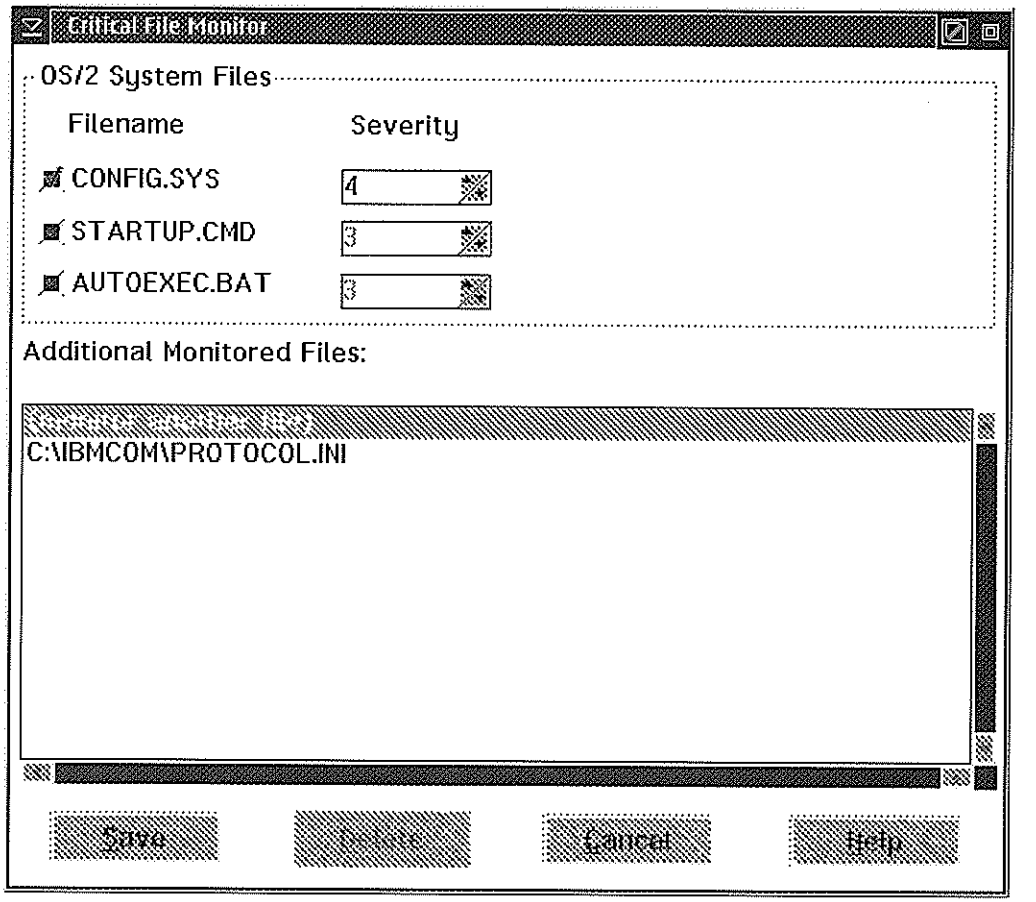


Figure 236. TME 10 NetFinity - Critical File Monitor

The OS/2 System Files box at the top of the dialog shows the system files that are normally monitored by the Critical File Monitor service. You can choose whether or not to monitor each of these files. Each file has a Severity field beside its name. Use the spin buttons to select a value for each file that you want to monitor. You can choose a value from 0 (most severe) to 7 (least severe).

The Critical File Monitor service enables you to monitor any file on your system. The Additional Monitored Files field contains a list of all other files that are currently being monitored. To select a file to monitor, double-click your left mouse button on the **monitor another file** entry in the list. This will open the Monitor window, as shown in Figure 237.

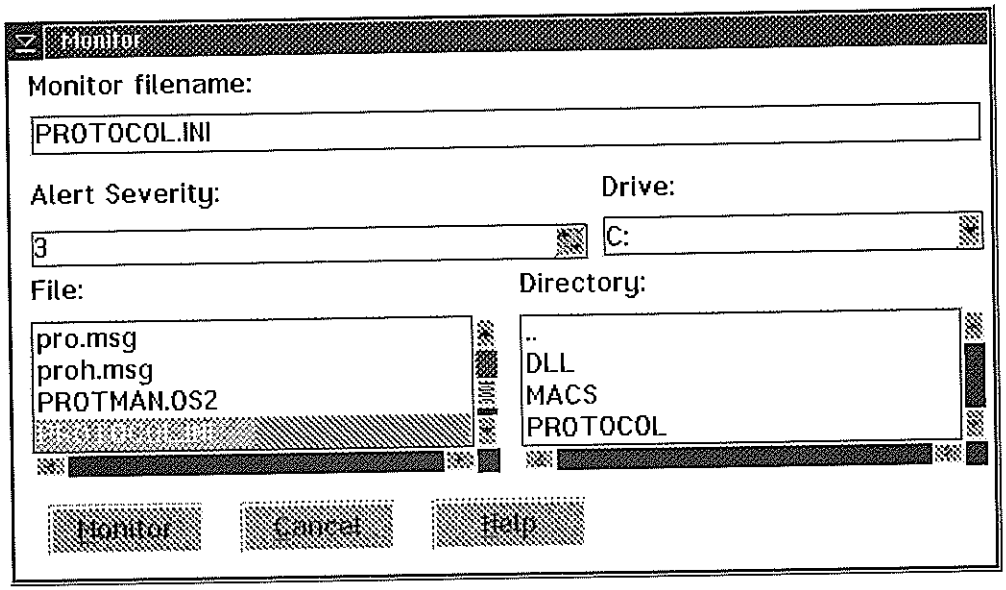


Figure 237. Critical File Monitor - Monitor Additional Files

Use the Monitor window to select a file to be monitored, and to set a severity value for the alert that will be generated if the selected file is altered or deleted. Select the **Monitor** button to initiate the monitoring process on the selected file.

If you are a system administrator, the example shown above illustrates a drawback of installing the TME 10 NetFinity Active Client on client systems in your network. Using the NetFinity Service Manager interface, any user can alter the monitoring of critical files on their own system, and possibly reduce your ability to detect an error.

DMI Browser: The DMI Browser service enables you to examine information about DMI-compliant hardware and software products (known as DMI components) that are installed in or attached to the system. These browser capabilities are described in 5.7.2.3, "Using the DMI MIF Browser" on page 427.

Note: The DMI Browser provided with TME 10 NetFinity is a special version of the DMI Browser that comes with the DMI Service Layer. Some functions that are available with the DMI Browser are not available in TME 10 NetFinity's DMI Browser service.

Security Manager: The Security Manager enables you to control remote access to the TME 10 NetFinity services on your system. You do this by assigning passwords to specific user IDs, then selecting which services those user IDs will be allowed to access. If an unauthorized user attempts to access your system, a panel will appear asking for a valid user ID/password combination. This ensures that only authorized administrators can access information about your system.

The Security Manager dialog is shown in Figure 238 on page 436.

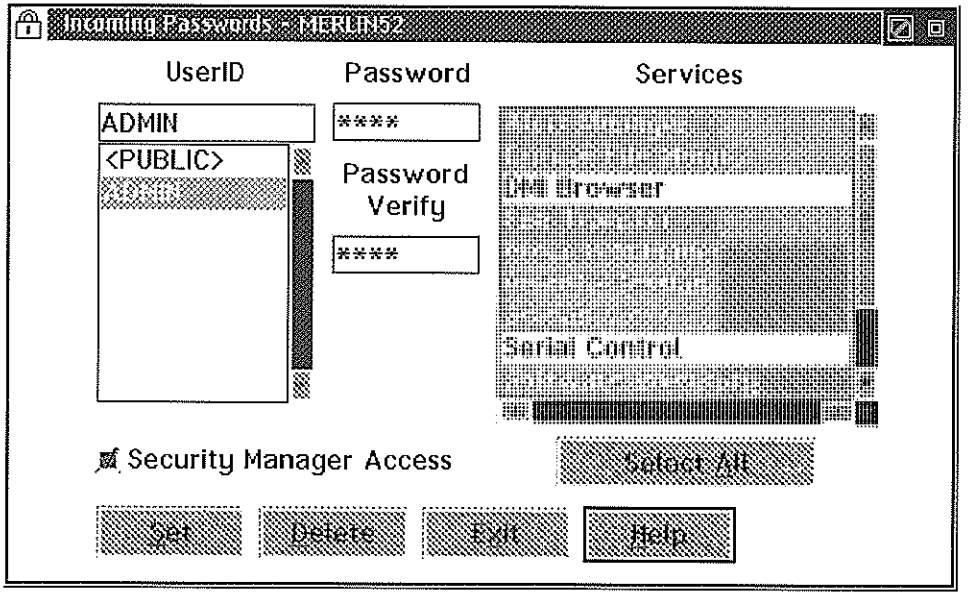


Figure 238. Security Manager

If the Security Manager has not been preconfigured, there will be a user ID named <PUBLIC>. This is a general security access default setting. The services available to this user ID can be accessed by *any* user, regardless of his/her user ID or password. If you wish to restrict access to certain services on your system, you must configure the <PUBLIC> user ID to remove access to those particular services.

Securing Your Network Workstations

For the sake of security, we recommend removing the <PUBLIC> user ID from your Security Manager configuration after another, more secure user ID is defined.

To define one or more user IDs for management access to an OS/2 Warp 4 system, you can enter a new user ID in the UserID field and then enter the password and the

appropriate services you want. You can alternatively use a response file to configure the Security Manager. This method also allows you to define management user IDs when installing OS/2 Warp 4 remotely using the CID installation process.

Serial Control: The Serial Control utility allows a remote system running NetFinity Manager software to access your local system via a modem. This allows a single system administrator to control remote workstations that are not directly connected to your local network.

If you double-click your left mouse on the **Serial Control** object, TME 10 NetFinity will display the NetFinity Serial Connection Control dialog, as shown in Figure 239 on page 437.

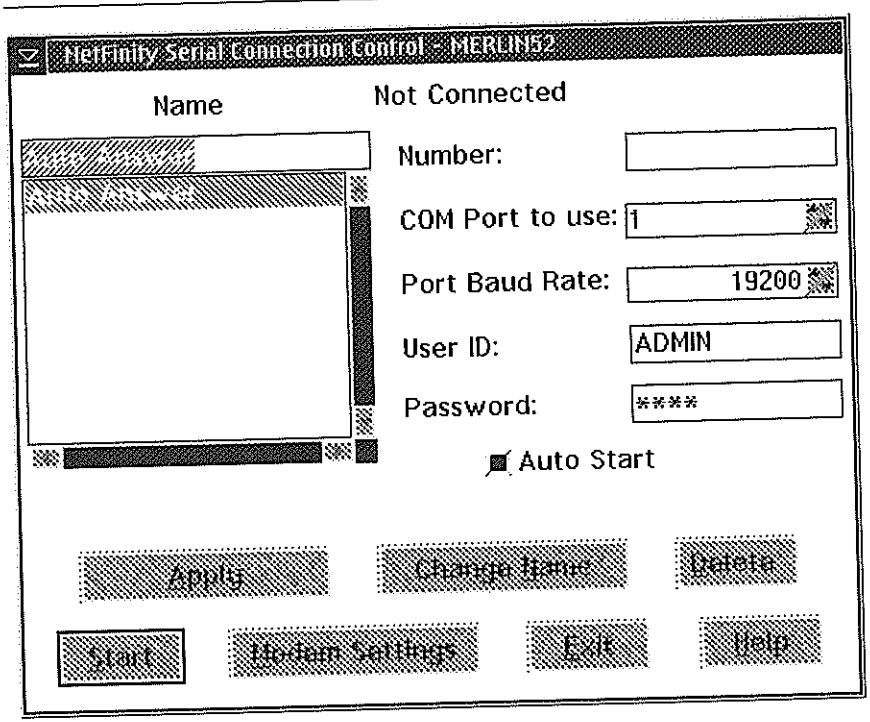


Figure 239. Serial Control

Select the **Start** button to initiate the currently selected entry in the list. If the current entry is *AutoAnswer*, the Serial Control utility will wait for a remote NetFinity Manager to attempt to access the system via the modem. If the entry is a configured remote system access entry, the Serial Control utility will initialize the modem, dial the specified telephone number, and attempt to connect to the remote system.

For further information on the capabilities of the Serial Control utility, see the information provided in the online help and the online documentation.

Software Inventory: The Software Inventory tool enables a system administrator to quickly and easily scan any system running TME 10 NetFinity for the presence of installed software products. Flexible scanning methods enable you to search for specific products or types of products (for example, word processors or graphics viewers), or to simply compile a record of all recognized software on a system. Reports can be printed to a file, sent to your printer, or exported to a database.

You can use the Software Inventory tool to display a list of recognized software on your OS/2 Warp 4 system. Figure 240 on page 438 shows an example of such a list.

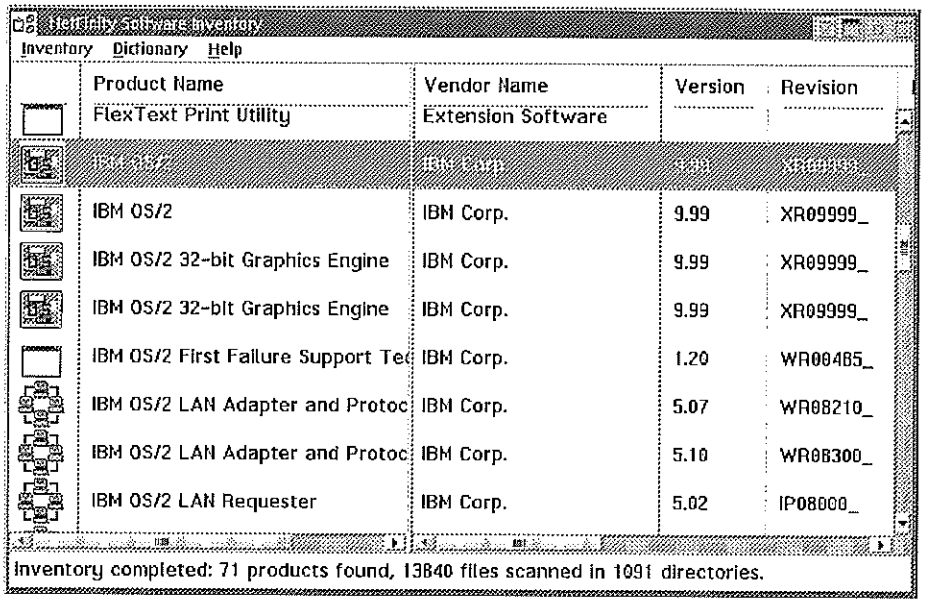


Figure 240. Software Inventory List

The Software Inventory tool includes an extensive dictionary file with many predefined software product definitions, so you can immediately begin keeping track of the software installed on your networked systems. If you wish, you can import product definitions from other inventory programs such as SPAudit or QSoft.

You can edit the Software Inventory tool's own dictionary to add your own definitions, using the Dictionary pull-down menu. You can define and identify products by the presence of specified file names (including files with a specified size or creation date, enabling you to search for only specific versions of software) or by the presence of a SYSLEVEL file.

The Software Inventory tool is particularly useful for system administrators, since they can scan all the systems on a network for particular software products. They can save this information in a file or import it into a database for reference and auditing purposes.

System Information: Just as the Software Inventory tool collects information about the installed software on a system, the System Information tool is designed to gather and display a variety of information about the hardware configuration.

When you start the System Information tool, it will display the System Information Tool window as shown in Figure 241 on page 439.

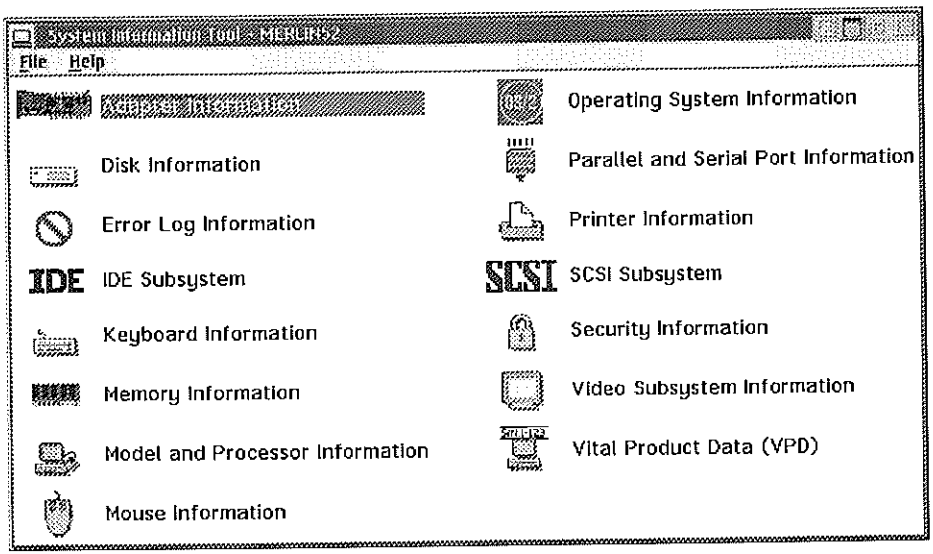


Figure 241. TME 10 NetFinity - System Information Tool

Note that there may be some differences between this example and your own OS/2 Warp 4 system. The objects displayed within the window reflect the specific types of hardware installed on your computer.

The System Information tool provides information on the following topics:

- Adapter identity, with configuration information for many common adapters. This feature is provided for PCI, Micro Channel, ISA, and EISA bus systems.
- Drive information, including file system type, available space, drive size, and partition layout
- Power management information
- Error log display and interpretation
- Keyboard information

- Memory configuration, including total physical memory and installed SIMM identification
- Mouse type and settings
- Operating system information, including version, DOS support, and session limits
- Model and processor information, including model name, processor type and speed, and BIOS date
- Parallel and serial port configuration
- PCI bus configuration
- PCMCIA bus configuration
- Printer configuration, including data on installed printer drivers
- SCSI, ESDI, IDE/ST506, or other disk adapter information, including devices attached, device sizes, and adapter data
- System security features, including power-on password and C2 features
- Video system information, including adapter type, panel resolution, and video display identification
- Vital product data (VPD)

In addition the graphical interface, the System Information tool can generate output directly to a file or printer. You can also operate the System Information tool from the command line if you wish.

System administrators can gain the greatest value from the System Information tool, since it enables them to scan all the systems on a network for specific hardware equipment, such as memory or hard disk capacities. This information can be stored in a file or imported into a database for future reference and auditing.

System Monitor: The system monitor provides a convenient method of charting and monitoring the activity of a number of components in your system. You can monitor:

- Locked memory usage
- Virtual memory usage
- CPU usage
- Disk space available and space remaining on each logical drive
- Disk utilization
- TCP/IP protocol functions
- Processes running
- Threads running
- Pentium processor computations
- RAID device attributes
- Read/write errors (NetFinity Manager only)

The data collected by the system monitor can be displayed immediately or stored in a database. You can choose between line graphs, text, and real time graphic

representations of system activity. These representations are sizeable and scalable, so you can organize information to suit your own needs.

The system monitor uses a data-handling technique that allows for both long-term system activity profiles and short-term, high-resolution system activity monitoring. As samples of system activity are taken, they are stored and displayed. However, after a number of samples have been taken, their individual values are weighted, several concurrent samples are averaged, and they are stored as a single, long-term value.

The purpose of this is twofold. Primarily, this is done to prevent system monitor data files from becoming so large that they begin to take up significant disk space on your system. This data-handling technique also allows for a more reasonable measurement of average long-term system workload, without sacrificing short-term monitoring abilities. This data-handling technique accounts for the initial "spiking" you may notice on line graphs when the system monitor is first started.

For further information on the capabilities of the system monitor, see the information provided in the online help and the online documentation.

System Profile: The System Profile acts as a repository for a variety of system- and user-specific information that might not be readily available elsewhere. The System Profile notebook includes many predefined fields to help simplify organization and entry of this data. The notebook also features many user-definable fields to help you customize the System Profile to meet your individual needs.

The data stored in the System Profile can be gathered by NetFinity Manager and exported to a database. The combination of the System Information tool's sophisticated hardware information-gathering abilities, along with the system- and user-specific data maintained in the System Profile, results in a very flexible and useful inventory and information facility.

5.7.4 Configuring the TME 10 NetFinity Network Driver Interface

The TME 10 NetFinity Network Driver Interface is initially configured during OS/2 Warp 4 installation. By default, it uses the NetBIOS (NETBEUI) transport protocol to communicate with NetFinity Manager software on the network. However, you can configure the Network Driver Interface to use a different transport protocol.

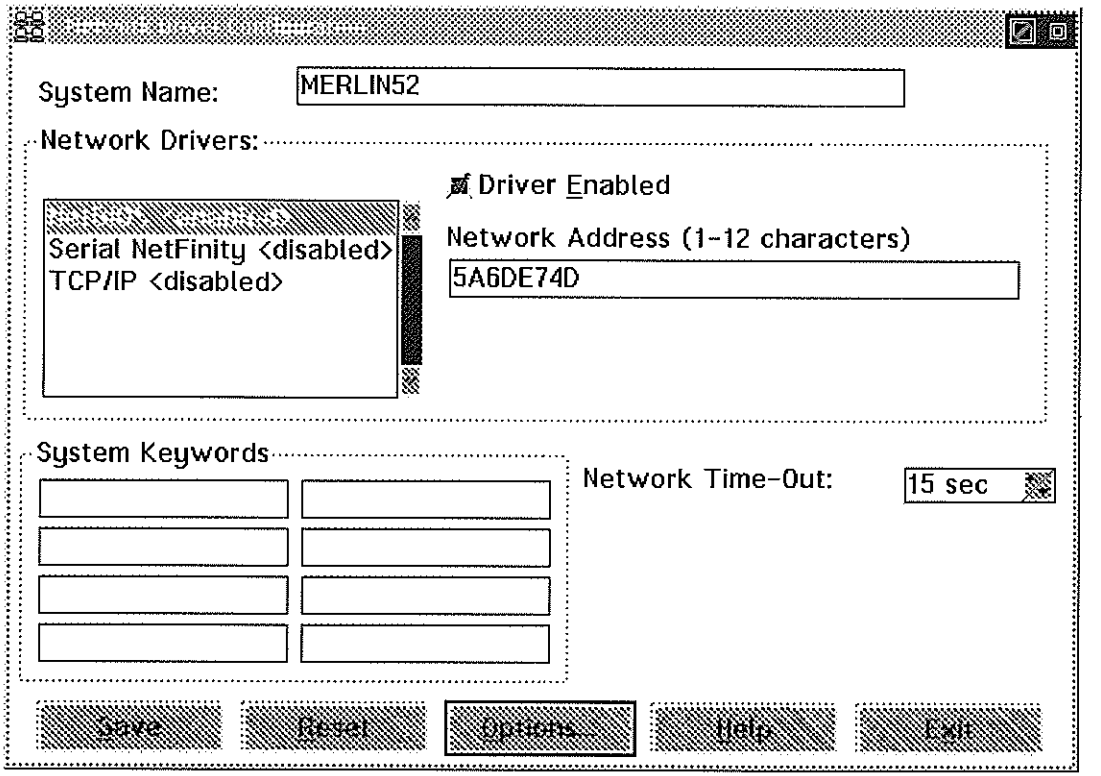


Figure 242. TME 10 NetFinity Network Driver Interface - Configuration

You can use this interface to add or change the following information:

System Name This name helps NetFinity Manager identify your system, and can be anything at all.

Network Drivers This group of fields displays all available network drivers supported by TME 10 NetFinity. You can enable one or more of the available drivers. Depending on the driver you choose, you can enter additional information such as the network address for the NetBIOS interface or a unique dial-up name for the serial NetFinity interface. After selecting a driver, you must enable it by selecting the **Driver Enabled** check box.

System Keywords These keywords help identify your system on the network. These keywords can be used by NetFinity Manager to place your system into one or more groups, making it easier for a system administrator to find your system. For example, you might enter the word "Personnel" for all systems in your

organization's personnel department, and a system administrator could then find that group of systems by searching on that keyword. You could also group workstations by the protocol they use, for example, NetBIOS, IPX or TCP/IP.

Network Time-Out This field enables you to set the default timeout period for TME 10 NetFinity applications. The timeout period determines how long an application will wait for a response to a request sent to a remote application, before a communication error is declared. The default Network Time-Out value is 15 seconds. If you have a heavily loaded system or network, setting the Network Time-Out field to a higher value can help correct application timeout problems.

When all information has been entered correctly, select the **Save** button to save your changes.

5.8 Multiple Protocol Transport Services

OS/2 Warp 4 contains a number of networking components, which can be used together in a variety of combinations, allowing you to access a wide range of network devices and resources. These different networking components typically use different network transport protocols (NetBIOS, TCP/IP, IPX, etc.). All these transport protocols are configured and managed by a component of OS/2 Warp 4 called Multiple Protocol Transport Services (MPTS), which allows you to use one or more protocols on your computer, and to use multiple protocols through a single network adapter.

MPTS is always installed. Under normal circumstances, MPTS will install itself, detect your network adapters and configure itself accordingly depending on the network adapters in your computer and the networking components you want to install. Typically, you do not need to do any manual configuration of MPTS.

However, MPTS does allow you to configure your network installation for particular needs, such as running emulated protocols over your LAN. If you wish to set up MPTS to do such tasks, you will need to perform some manual configuration.

MPTS consists of two main components:

- **LAN Adapter and Protocol Support (LAPS)** provides adapter, protocol, and LAN Virtual Device Driver (VDD) support
- **Sockets/MPTS** provides a transport framework that allows applications written to the sockets programming interface to communicate using a number of underlying protocols (TCP/IP, NetBIOS or local interprocess communication).

Figure 243 shows the main components of MPTS.

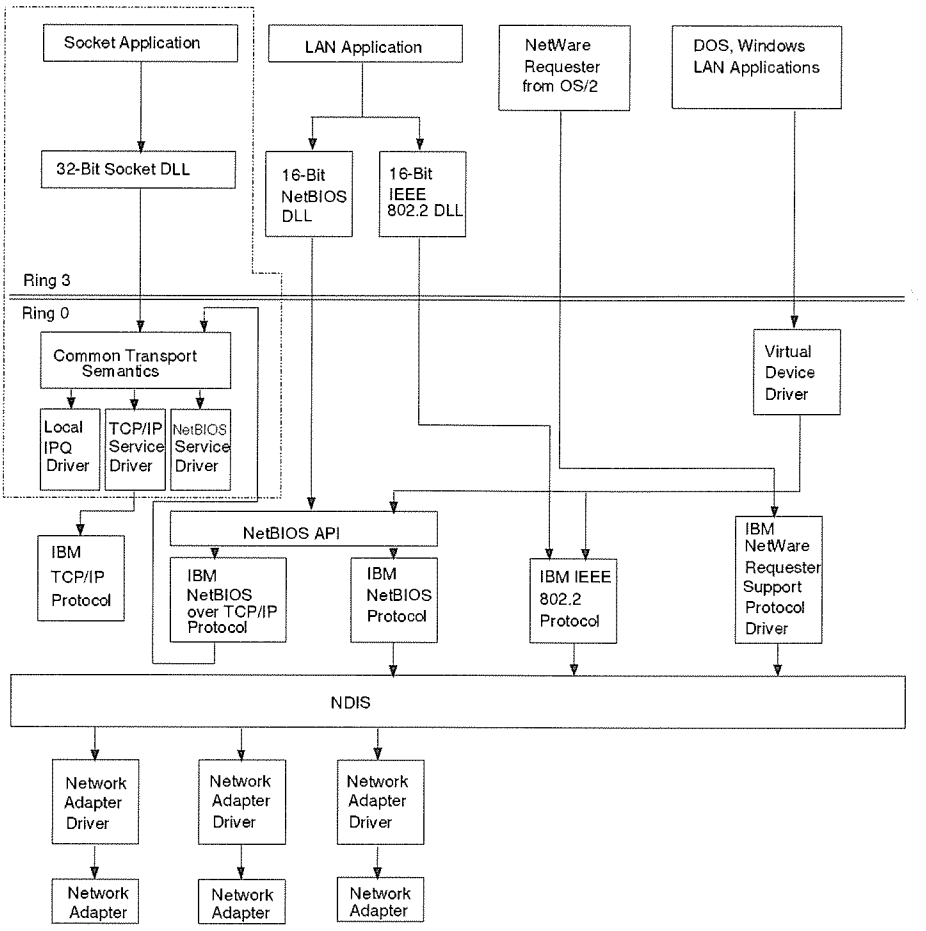


Figure 243. MPTS Components

Note that the modules within the broken line comprise the Sockets/MPTS component.

5.8.1 LAN Adapter and Protocol Support

Network protocol handling in OS/2 Warp 4 is based on the Network Driver Interface Specification (NDIS). This is an industry standard jointly developed by 3COM and Microsoft Corporation. NDIS allows different network protocols to operate over the same LAN interface at the same time.

NDIS is a standardized Media Access Control (MAC) interface for network adapter drivers and protocol drivers. It has become a de facto industry standard, providing a

common, open interface that enables different manufacturers of network adapters and LAN software developers to produce products which communicate with each other.

The NDIS standard defines:

- Specifications for network adapter drivers, also known as *MAC drivers*, which provide the communication between a physical network adapter and a network protocol driver. The main function of the network adapter driver is to support network packet reception and transmission.
- Specifications for network protocol drivers, which provide the communication between a network application and a network adapter driver.
- Binding processes and communications interfaces between these two types of drivers.

NDIS separates protocol handling from hardware manipulation by explicitly defining functions that protocol drivers and network adapter drivers must provide to each other. Each driver has an upper and a lower boundary, and the drivers are linked together to form a *protocol stack* by binding the lower boundary of one driver to the upper boundary of another driver. The network adapter driver at the "bottom" of the stack always has its lower boundary connected to the physical layer, that is, the network adapter hardware itself.

The NDIS specification defines the binding process for the drivers. In OS/2 Warp 4, the details of adapter and protocol drivers, and the binding information to enable communication between them, are stored in a file named PROTOCOL.INI.

The LAPS component of MPTS contains the protocol and adapter drivers, utilities and configuration files to manage them, and a utility for easy installation and configuration of drivers. LAPS also contains *virtual device drivers* which make the installed protocols available to DOS and Windows applications running under OS/2 Warp 4, without the need for specific DOS protocol drivers.

5.8.1.1 Supported Protocols

LAPS supports the following network protocols:

- IEEE 802.2
- NetBIOS
- TCP/IP
- IPX/SPX
- NetBIOS emulation over TCP/IP
- NetBIOS emulation over IPX

Note that the IPX protocol, used by Novell in its NetWare networking operating system, does not normally lend itself to implementation in an NDIS-compliant manner. OS/2 Warp 4 includes a facility that enables the IPX protocol to operate in an NDIS-compliant manner, without compromising communication with other computers running regular IPX protocols.

5.8.1.2 Installing a Non-Supported Protocol

If you have an application that requires a protocol that is not listed above and is supplied with the application or even separately, here is how to install it in MPTS:

1. Click on **OS/2 System=> System Setup=> MPTS**.
2. Select **OK**, then **Configure** in the Multiple Protocol Transport Services panel.
3. Choose the default radio button **LAN adapters and protocols** in the Configure panel.
4. Click on **Configure** at the bottom left of the panel.
5. The Adapter and Protocol Configuration panel will take a few seconds to come up.
6. Click on the **Other protocols...** button in the Protocols section (top right of the panel).
7. You will get the Copy Additional Protocols dialog box. Put in the diskette or CD-ROM and enter the pathname of where the protocol drivers are located. Protocol drivers may be made up of several files. A *.NIF file is usually part of the driver. Click on **OK** to install the protocol driver. The files will be copied to the IBMCOM\PROTOCOL directory.
8. The new protocol driver has now been installed. You should go back to the Adapter and Protocol Configuration panel. You can now configure the protocol (refer to 5.8.1.5, " Configuring LAPS" on page 448).

5.8.1.3 Using Multiple Protocols

NDIS allows you to bind multiple protocol drivers to a single adapter driver, that is, to share a network adapter among several different network applications, each of which may be using a different network protocol. Figure 244 shows the NDIS protocol stacks when the File and Print Client running NetBIOS, along with other applications running IEEE 802.2 and TCP/IP, are loaded together.

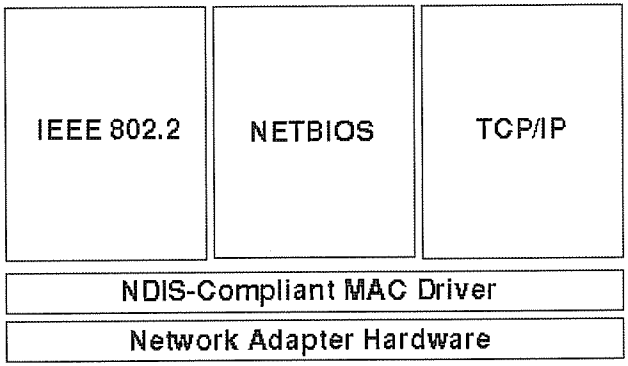


Figure 244. NDIS - Multiple Protocols

In the example above, you may have one or more network adapters in use. When using multiple adapters, the simplest method is to allow all protocols to be bound to all adapters. However, if you wish you can dedicate one adapter to a particular protocol stack, perhaps to provide improved performance for a critical network application. For example, the NetBIOS and IEEE 802.2 protocol stacks can be bound to one adapter, while the other adapter is dedicated to the TCP/IP protocol. The configuration information defining which protocols are bound to which adapters is stored in the PROTOCOL.INI file, and can be set or modified using the MPTS utility.

5.8.1.4 Installing a Non-Supported Network Adapter

When you install the networking components of OS/2 Warp 4, you will have an opportunity to install drivers that are shipped with MPTS. whether you choose the **Easy** or **Advanced** installation selection (see 5.1, "Installing OS/2 Warp 4 Network Components" on page 262). You can also install other network adapters *after* you have installed OS/2 Warp 4. This may occur because you want to add or change a network adapter on your workstation. The process for adding a different adapter is as follows:

1. Install the network adapter into the workstation. Be sure to follow the network adapter's instructions. These will override our instructions if they differ. Older adapters may need to have jumper or dip switches for settings such as IRQ, I/O port and DMA address set. Newer adapters may have a software configurator to do this or may not need any configuration at all. You may notice a 12-digit number written on the adapter/instructions or found when using the software configurator. This number can be called a MAC address, node address or universal administered address (UAA). It will be a unique address for the adapter on the LAN - you will be able to change this later in LAN Adapter and Protocol Support (LAPS) configuration. If you change the address, it is called a locally administered address (LAA) and is administered by your network administrator.

2. Click on **OS/2 System=> System Setup=> MPTS**. Click on **OK** then **Install** at the Multiple Protocol Transport Services panel.
3. The Install Additional Network Drivers dialog box will appear. It discusses the Network Information files. OS/2 NDIS drivers (for example, drivers for MPTS) are usually made up of two files. They usually have the same file name but different extensions, for example, TOKEN.NIF and TOKEN.OS2. The *.NIF or Network Information File is basically an ASCII file that contains configuration parameters for the adapter. The *.OS2 file is the driver itself. If you are unsure whether your adapter has OS/2 NDIS drivers, look for these two files on the network adapter's driver diskette or CD-ROM.
4. Put the network adapter's driver diskette or CD-ROM in the appropriate drive and enter the path name. Then click on MPTS will automatically find the two files and install them. You should get the message `Transferring Files - Please wait` then `Installation Complete`. The two files will be put the IBMCOM\MACS directory. The name of the driver may appear when installing the driver. Be sure to take note of this as you will need it when configuring the adapter. If the name doesn't come up, you can find the driver's name listed in the *.NIF file on the diskette or CD-ROM (check the "Title" option).

   Note: Be sure to put the path name of the directory where the two files are located. Otherwise, the driver may not be found.

   If you get a message `No network information files were found at the specified path. Reenter the source for additional drivers`, you have either entered the wrong path name for the drivers or the driver is not an OS/2 NDIS driver. In the case of the latter, you will need to contact the adapter's manufacturer to find if drivers are available.
5. If the drivers are successfully installed, you will get the Multiple Protocol Transport Services dialog box. You can now configure the adapter driver (refer to 5.8.1.5, " Configuring LAPS" on page 448).

Another Method to Install Non-Supported Network Adapters

You can add another adapter while you are actually configuring LAPS. When in the **Adapter and Protocol Configuration** panel, choose the **Other Adapters...** option under Network Adapters. This goes through a similar process as discussed above.

5.8.1.5 Configuring LAPS

The PROTOCOL.INI file contains NDIS configuration information for network adapter drivers and protocol drivers for your computer. PROTOCOL.INI is an ASCII file, and you can edit it manually, but this is *not* recommended. We recommend that you always use the MPTS utility, which will verify the changes you request and ensure that the resulting PROTOCOL.INI and CONFIG.SYS files are valid.

To use MPTS, click on **OS/2 System=> System Setup**.

1. Double-click your left mouse button on the **MPTS** icon. The MPTS utility will display a window containing a number of buttons. Select the **Configure** button, and the MPTS utility will display the Configure window, as shown in Figure 245.

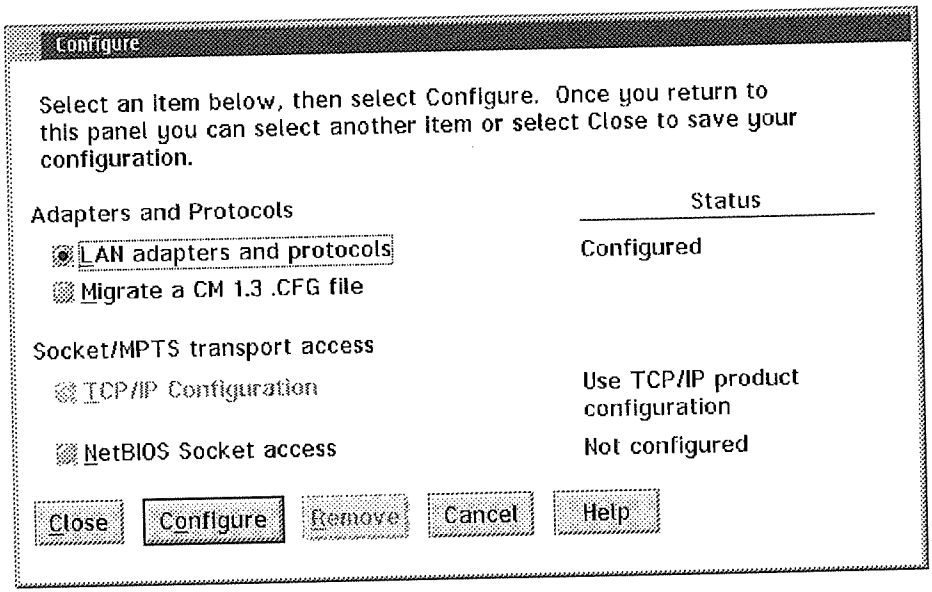


Figure 245. MPTS - Configure Options

2. Select the **LAN adapters and protocols** radio button, then select the **Configure** button to display the Adapter and Protocol Configuration window, as shown in Figure 246.

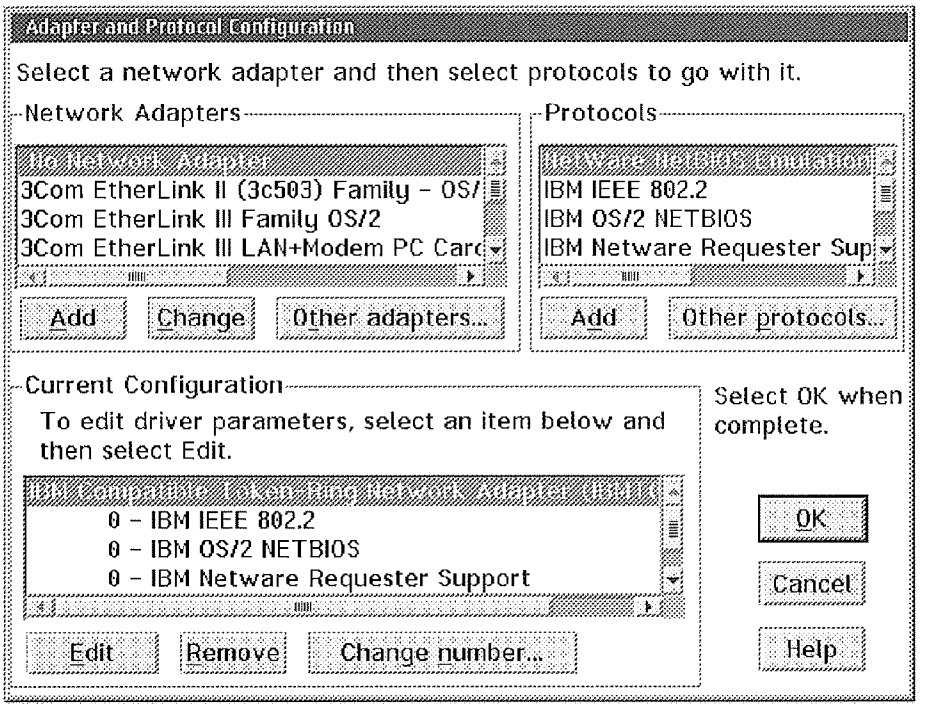


Figure 246. LAPS Configuration

3. You can use this panel to select the network adapters for which LAPS should configure adapter drivers, and the transport protocols you want to bind to each adapter.
4. Select an adapter from the list at the top left, and add it to your configuration by selecting the **Add** button below this list. The adapter will then appear in the list at the bottom of the window.
5. To bind a protocol to this adapter, select the adapter in the list at the bottom of the window, then select the protocol you wish to bind to the adapter, from the list at the top right. Select the **Add** button below this list to bind the protocol to the adapter.
6. To modify the configuration of the adapter or protocol, you can either double-click on the adapter/protocol or highlight the selection and click on **Edit**. You can get help on any of the fields by highlighting the field with the mouse and pressing F1.

Important Points on Configuring Adapters and Protocols

In most cases, you do not need to change the configuration parameters for the adapter(s) or protocol(s). However, there are some important points to consider:

- Make sure that the configuration parameters for the adapter in MPTS are the *same* as the ones that you set on the adapter itself for example, IRQ or I/O port address. If they are not, MPTS will not work.
- If you are using the *burnt-in* or MAC address of the adapter (that is, the 12-digit address that came with the adapter), you can leave empty the Network Adapter Address field in both the adapters and protocols you select. An exception is the IBM NetWare Requester Support protocol. This *must always* have an address in this field, even if you are using the burnt-in address (see 5.8.5, "Novell NetWare Client" on page 472 for more details). The Easy and Advanced installation procedures will automatically put in the address for you, even if you go through the Selective Install for Networking process.
- If you use locally administered addresses (LAAs), for example, which are administered by your network administrator, you will need to update both the adapter *and* the protocol with the address in this field (although not all protocols have this field, such as IBM TCP/IP - in which case you do not need to worry about the address). In addition, you will need to put either an **I** for Ethernet adapters or **T** for token-ring adapters in front of the network address for the protocols *only* (for example, T400012344444). Pressing F1 in the field will give you more help. Contact your network administrator to see if your network uses locally administered addresses.

7. When you have selected and configured all the adapters and protocols you require, select the **OK** button at the bottom right. The MPTS utility will save your changes, and return you to the previous window.
8. Select the **Exit** button to save your changes and return to the desktop. The utility will ask you whether you wish to update your CONFIG.SYS file. Under normal circumstances, select the **Yes** button to have the utility update CONFIG.SYS automatically.
9. If you have added or changed network adapters, you will now need to reboot your system in order for the new adapter drivers to be loaded. However, if you changed only network protocol definitions, you can simply restart MPTS using the MPTSTART command from the command line.

PROTOCOL.INI: The PROTOCOL.INI file contains NDIS configuration information for network adapter drivers and protocol drivers for your computer. Whenever possible, use the MPTS utility to make changes to PROTOCOL.INI.

Note - Technical Subject Alert

Unless you have a particular need to work with the contents of the PROTOCOL.INI file, you probably do not need to read this section.

The PROTOCOL.INI file consists of four sections:

- Protocol Manager
- Configuration Section
- Protocol Drivers
- MAC (network adapter) drivers

All these sections have the structure:

```
[module name]
  parameter=value
```

Figure 247 shows a sample PROTOCOL.INI file, configured with both NetBIOS and TCP/IP protocol stacks (as in the example shown in Figure 244 on page 447). The first entry is the protocol manager, which is the driver that controls the binding process.

```
[PROT_MAN]

   DRIVERNAME = PROTMAN$
```

The configuration section defines which network protocols are to be used, and what network adapters are to be configured. In the example, `netbeui_nif` and `tcpbeui_nif` are the protocol drivers, and `IBMTOK_nif` is the adapter configuration (in this case an IBM Token-Ring Adapter).

```
[IBMLXCFG]

   netbeui_nif = netbeui.nif

   tcpip_nif = tcpip.nif
   IBMTOK_nif = IBMTOK.NIF
```

Each protocol driver has its own section in PROTOCOL.INI. These sections define the parameters used to configure the network protocol, such as the number of communication buffers, timeout values and so on.

The `Bindings=` parameter for each protocol driver specifies the module name of the adapter driver with which the protocol driver will bind. In the example, NetBIOS uses the NetBEUI protocol driver, which itself is bound to the token-ring adapter driver `IBMTOK_NIF`. TCP/IP is also bound to the token-ring adapter driver through its TCPIP protocol driver.

```
[NetBIOS]

   DriverName = netbios$
   ADAPTER0 = netbeui$,0

[netbeui_nif]

   DriverName = netbeui$
   Bindings = IBMTOK_nif
   ETHERAND_TYPE = "I"
   USEADDRREV = "YES"
   OS2TRACEMASK = 0x0
   SESSIONS = 130
   NCBS = 225
   NAMES = 21
   SELECTORS = 15
   USEMAXDATAGRAM = "NO"
   ADAPTRATE = 1000
   WINDDWERRORS = 0
   MAXDATARCV = 4168
   TI = 30000
   T1 = 1000
   T2 = 200
   MAXIN = 1
   MAXOUT = 1
   NETBIOSTIMEOUT = 500
   NETBIOSRETRIES = 2
   NAMECACHE = 1000
   RNDOPTION = 0
   PIGGYBACKACKS = 1
   DATAGRAMPACKETS = 10
   PACKETS = 350
   LOOPPACKETS = 8
   PIPELINE = 5
   MAXTRANSMITS = 6
   MINTRANSMITS = 2
   DLCRETRIES = 10
   FCPRIORITY = 5
   NETFLAGS = 0x0

[tcpip_nif]

   DriverName = TCPIP$
   Bindings = IBMTOK_nif

[IBMTOK_nif]

   DriverName = IBMTOK$
   MAXTRANSMITS = 6
   RECVBUFS = 2
   RECVBUFSIZE = 256
   XMITBUFS = 1
```

Figure 247. Sample PROTOCOL.INI File

The final section in the example provides the definition for the adapter itself, specifying the name of the adapter driver along with the parameters necessary to configure the driver for use with the various network protocols that will be bound to it.

The Binding Process: When you boot your computer, MPTS is initialized and the protocol manager binds the adapter driver(s) to the protocol drivers, allowing your network applications to use these protocols to communicate on the network using the adapter(s) in your computer. This binding process proceeds as follows:

1. The protocol manager is loaded before any adapter or protocol drivers. It reads and parses the information in the PROTOCOL.INI file into an image table that is accessible to other NDIS drivers.
2. As CONFIG.SYS processing continues, other drivers are loaded. As each driver is initialized, it reads the related information in the image table to configure itself, then registers with the protocol manager.
3. After all drivers and protocols are processed, the protocol manager has a list of active NDIS drivers and their desired bindings.
4. The protocol manager issues a NETBIND command, and the desired bindings take place.

At this point, the network adapter drivers and protocol drivers are active and ready to be used by network applications, which you can start manually from your desktop or automatically using the Startup folder or the STARTUP.CMD file.

5.8.1.6 Using Protocol Emulation

The File and Print Client is a NetBIOS application that you would normally set up to use the NetBIOS protocol stack. However, NetBIOS has some characteristics that limit its use in certain communications environments:

- The NetBIOS protocol can be used only on a LAN
- The NetBIOS protocol cannot be routed
- The NetBIOS protocol uses single route broadcasts to establish connections

In light of these limitations, it may be better to use a different network protocol to communicate on your LAN, particularly if you have a large network involving routers and multiple sites.

Another reason you might want to use a different protocol is if you have a complex network environment that is already running one or more network protocols, and you do not want to further complicate network management by adding a new protocol.

MPTS allows you to overcome these difficulties by providing NetBIOS emulation capabilities. These drivers allow NetBIOS applications to communicate over the network using other protocols. MPTS provides the following protocol emulations:

- NetBIOS emulation using TCP/IP, as defined by the RFC 1001 and RFC 1002 specifications
- NetBIOS emulation using the IPX protocol

The capability to run NetBIOS applications using routable protocols offers new flexibility when designing networks that will use the File and Print Client. Peer workstations, requesters and servers can reside on remote LAN segments connected by routers. This also means that peer workstations can be introduced into existing TCP/IP or IPX networks, without the complications involved in introducing an additional network protocol.

5.8.2 Sockets/MPTS

With the growth of networking in general and local area networks in particular, it is not uncommon to see network configurations using four or five different protocols, such as TCP/IP, NetBIOS, SNA, or AppleTalk. One major problem in such environments is interoperability, since applications that run on one network often do not run with applications on other networks.

Multiprotocol Transport Networking (MPTN) addresses these problems. It defines an architecture that allows a network application on one device to communicate with other devices across a network, or networks, without concern for the underlying protocols in use. This protocol independence for applications is provided by two aspects of MPTN:

- **Common Transport Semantics** (**CTS**), which provides the capability to write an application once and have it run on different network protocols
- **MPTN gateways**, which connect two different single-protocol networks and provide cross-network directory and routing services between them

The Sockets/MPTS component of MPTS provides Common Transport Semantics for the Multiprotocol Transport Network. It *does not* provide the MPTN gateway function, which is available as a separate product from IBM.

5.8.2.1 CTS - a User's Perspective

One question you may ask yourself is why do you need so many different network protocols and configurations? This section may help you find an answer to this question.

As users of information technology, we are primarily concerned with applications. These can range from simple applications running on a single computer, to complex client/server applications that depend on networks in order to run. It is in this latter area that problems arise for almost every user and business organization.

Today's applications are used to overcome problems in the data processing or information flow of an enterprise, and are often implemented using standard software packages. A major concern is therefore that of choosing the best application or software package for the job. With client/server applications, however, suitability for the task at hand is not the only concern. You must also determine whether a particular software package suits your network infrastructure. This often means that you cannot choose the most suitable alternative, and you may have to settle for second best.

For example, many large business organizations have SNA networks, but would like to introduce more open, TCP/IP-based client/server applications. In the past, such applications could not be run in an SNA environment. Similarly, IPX/SPX applications written to run with Novell NetWare could not be run in a NetBIOS environment, and vice versa. These problems have been a major headache for network administrators.

IBM has gone a long way toward solving this problem with the introduction of multiprotocol networking, and Common Transport Semantics (CTS). CTS is a part of IBM's Open Blueprint, which is an open architecture for distributed computing. CTS separates the network interface (that is, the way an application talks to the network) from the underlying transport protocol, allowing you to run an application written for one protocol, over a network that is implemented with another protocol. For example, you can run a NetBIOS application over a TCP/IP network, or a TCP/IP application over an SNA network. This means that you can choose the best client/server application for your needs, without worrying about whether it fits into your existing network.

So how does this work? When we are talking about CTS or AnyNet, which is the family of IBM products that implements CTS, it is most important to differentiate between the expressions normally used in a networking environment. When we speak of TCP/IP or NetBIOS, we usually mean both the transport protocol *and* the programming interface. However, the two are not necessarily the same thing. For example, you would normally use the sockets programming interface to write an application for the TCP/IP protocol, or the Transport Layer Interface (TLI) when writing an application for Novell's IPX/SPX protocol.

It is important to remember that while a programming interface and a transport protocol may often go hand in hand, there is not necessarily any interdependence between the two. In theory, four different interfaces (NetBIOS, TLI, APPC/CPI-C and Sockets) can be combined with four different protocols (NetBEUI, SPX/IPX, SNA and TCP/IP). This leads to sixteen possible combinations, and means that you can implement any application on any transport protocol, provided a translation layer exists that allows the application to call the necessary protocol services.

Most of the translation services for these combinations are already implemented in the IBM AnyNet family of products. The following are very popular combinations:

- NetBIOS over TCP/IP (sometimes known as TCPBEUI, and available as part of OS/2 Warp 4)
- Sockets over NetBEUI (as available in IBM Warp Server)

The AnyNet products can also provide solutions for a wide-area network (WAN) environment:

- Sockets over SNA
- APPC/CPI-C over TCP/IP

These two combinations are packaged into IBM's Communications Software Server product, and provide an overlap between the traditional LAN and WAN environments. For example, you can run an SAP-R/3 application over an SNA network instead of a TCP/IP network. Multiprotocol networking with the AnyNet products allows you to choose the application *and* the protocol that best fits your needs, without any dependency between the two.

5.8.2.2 How to Use Sockets/MPTS

CTS provides a semantic interface so that higher-level protocols or application interfaces written for a particular network protocol can be transported over another protocol with no change to the application. The Sockets/MPTS version of MPTN supports TCP/IP and NetBIOS protocols.

When an application is written to use a particular programming interface and transport protocol, and the protocol chosen to provide the network transport matches the protocol within the application, this is known as *native networking*. On the other hand, when a different transport protocol is used, this is known as *non-native* networking. These terms will be used extensively in this section.

TCP/IP applications, which are typically written to use the sockets interface, normally run natively, that is, using the TCP/IP protocol. However, it is possible to run them using the NetBIOS protocol. For example, a computer on a LAN configured in this way could use FTP to transfer a file to another similarly configured computer, and the traffic flow between them would be NetBIOS. This is non-native networking. The application (in this case FTP) is unaware of the fact that a different transport protocol is being used to provide the service. Other applications written for the TCP/IP protocol can also run unaltered over NetBIOS in a Sockets/MPTS environment. Figure 248 shows the data path when a TCP/IP application uses an underlying NetBIOS protocol.

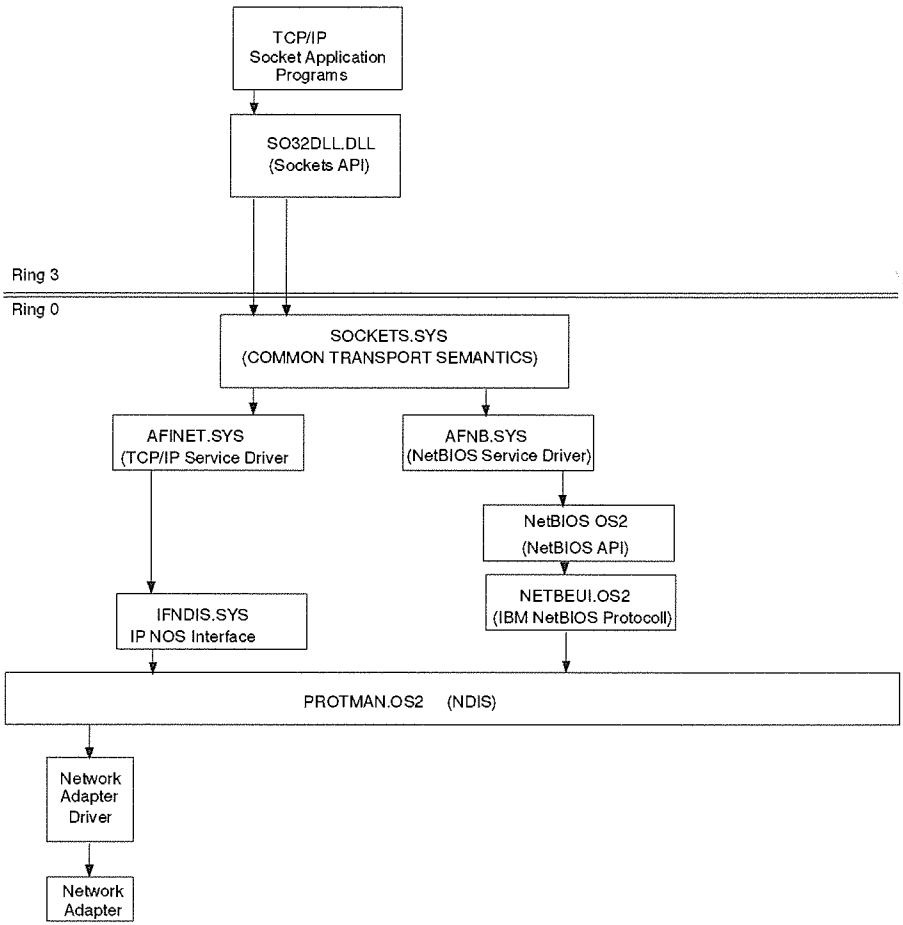


Figure 248. TCP/IP Sockets Application - Native and Non-Native Networking

Using Sockets/MPTS on its own *only* allows native networking of sockets applications. However, the version of MPTS provided with OS/2 Warp 4 allows coexistence with the IBM AnyNet/2 product. AnyNet/2 allows you to run non-native networking, and also introduces an SNA services driver, which allows you to run TCP/IP or NetBIOS applications over SNA networks.

The socket interfaces provided with Sockets/MPTS allow you to write distributed or client/server applications using local interprocess communication, TCP/IP or NetBIOS protocols. The application can select the transport protocol or request that the Sockets/MPTS layer determines the protocol.

Most sockets applications available today communicate using either TCP or UDP interfaces. However, with the non-native networking feature allowing TCP/IP over NetBIOS, these applications can communicate with one another using NetBIOS. Therefore, you can choose the network transport for your sockets application to suit your network environment, without needing to modify the application itself.

Note that some applications are written to communicate directly with TCP/IP. These applications must be rewritten to the sockets programming interface before they can take advantage of non-native networking features.

5.8.2.3 Configuring Sockets/MPTS

You configure Sockets/MPTS from the Configure panel in the MTPS utility (see Figure 245 on page 449). The selectable protocols are TCP/IP and NetBIOS.

To configure TCP/IP access, you must use the TCP/IP Configuration notebook. To select NetBIOS access, you must have the NetBIOS protocol installed and configured in your OS/2 Warp 4 system. You must select at least one protocol for your Sockets/MPTS environment, but you may select more than one protocol.

5.8.3 NetBIOS over TCP/IP

As well as providing a TCP/IP protocol, the LAPS component of MPTS provides the TCPBEUI protocol, which is a unique implementation of NetBIOS over TCP/IP. Using TCPBEUI, you can run NetBIOS applications such as peer services or the requester service on a TCP/IP network, enabling your OS/2 Warp 4 to be geographically isolated from other systems running peer services, or from servers, yet still communicate with them transparently.

Note

Before the release of MPTS, it was possible to implement a NetBIOS application over TCP/IP by installing TCP/IP V2.0 for OS/2 and an additional product, NetBIOS V2.0 for TCP/IP (also an implementation of RFC 1001/1002 specifications). However, this older implementation was less efficient and did not perform as well as the new TCPBEUI included in OS/2 Warp 4.

TCPBEUI is a high-performance implementation of NetBIOS for TCP/IP, and runs at Ring 0, the highest level of privilege in the Intel processor. Since MPTS provides the TCP/IP protocol stack and the sockets interface necessary to configure TCPBEUI, you do not need to install the TCP/IP component of OS/2 Warp 4 unless you wish to use the native TCP/IP applications that are provided with this component.

TCPBEUI does *not* use encapsulation. Instead, it builds RFC 1001/1002 packets and sends them out via UDP and TCP. For example, once a NetBIOS session has been established, TCPBEUI will use sockets send commands over a TCP connection to send NetBIOS session data. TCPBEUI builds a 4-byte session header that precedes the

actual user data. Thus, a NetBIOS `Chain Send` of 128 KB would have an overhead of only 4 bytes.

TCPBEUI provides an LM10 protocol driver interface to enable the NetBIOS application services (used by network applications) to communicate with the protocol driver. This is the same LM10 interface provided by the standard NetBIOS protocol driver (NetBEUI), so applications written to use the NetBIOS interface will be able to use the TCPBEUI interface without modification.

TCPBEUI includes enhancements over the RFC 1001/1002 standards that improve system performance by decreasing broadcast storms, and expanding communications over routers and bridges. These enhancements, described in 5.8.4, "How to Reduce Broadcast Frames Using TCPBEUI" on page 466, are transparent to NetBIOS applications.

TCPBEUI allows peer-to-peer communication over the TCP/IP network with other computers that have compatible services. Figure 249 gives an overview of the relationship between the NetBIOS, TCPBEUI and TCP/IP protocol stacks.

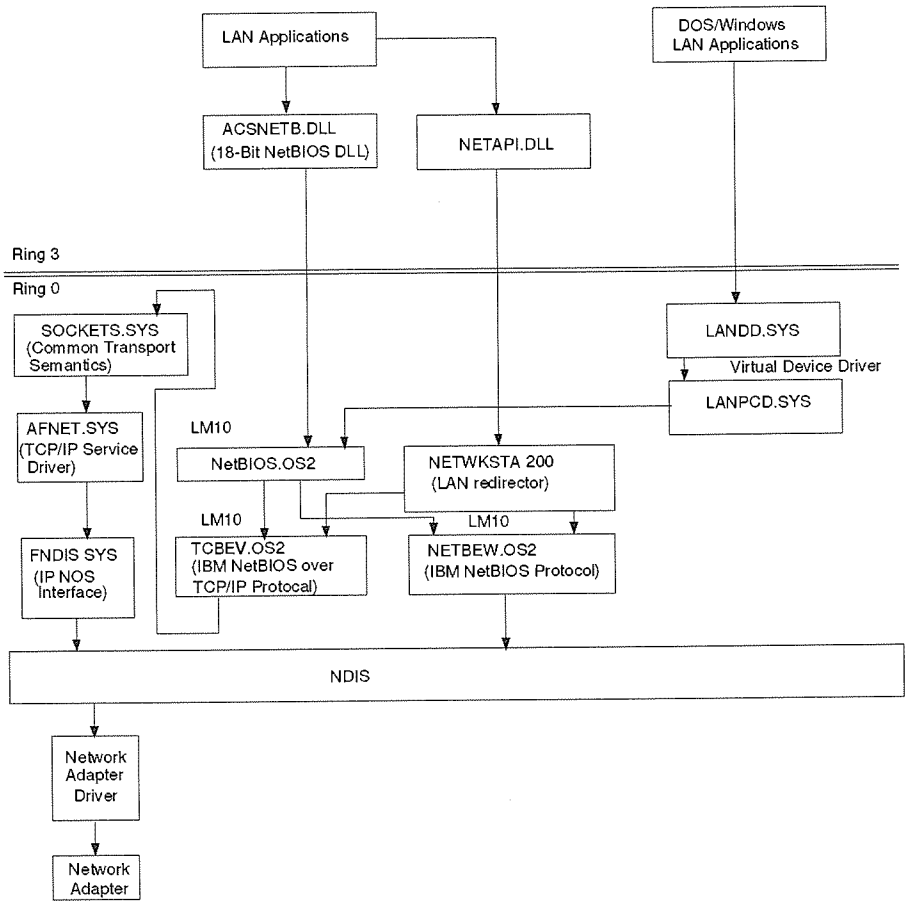


Figure 249. NetBIOS over TCP/IP Structure

In Figure 249 on page 461, you can see that ACSNETB.DLL provides a ring 3 NetBIOS interface for application programs. Ring 3 NetBIOS commands are sent to NetBIOS.OS2 for processing. NetBIOS.OS2 provides a ring 0 NetBIOS interface for other device drivers to use, and also binds to one or more LM10 (LAN Manager 1.0) protocol drivers.

NETWKSTA.200, the LAN redirector component of both peer services and the requester service, also uses the LM10 interface directly, and in this example is using both TCPBEUI and NetBEUI.

Support for NetBIOS over TCP/IP can easily be added to an existing NetBIOS structure since NetBIOS.OS2 supports multiple LM10 protocol drivers. Support is provided simply by having NetBIOS.OS2 bind to TCPBEUI.OS2. To enable NETWKSTA.200 to use TCPBEUI, there must be a `NET x` statement in the IBMLAN.INI file (see Figure 253 on page 465 for more information).

MPTS allows you to configure peer services or the requester service to use both NetBEUI and TCPBEUI on the same network adapter. This dual protocol stack configuration allows local sessions to continue running with NetBEUI performance, while also providing routable connections using TCPBEUI.

5.8.3.1 Coexisting with Native NetBIOS or TCP/IP

MPTS allows you to run multiple protocol stacks through a single network adapter. This ability applies to emulated network protocols as well as "native" protocols, so native NetBIOS or TCP/IP applications can coexist alongside other applications using TCPBEUI.

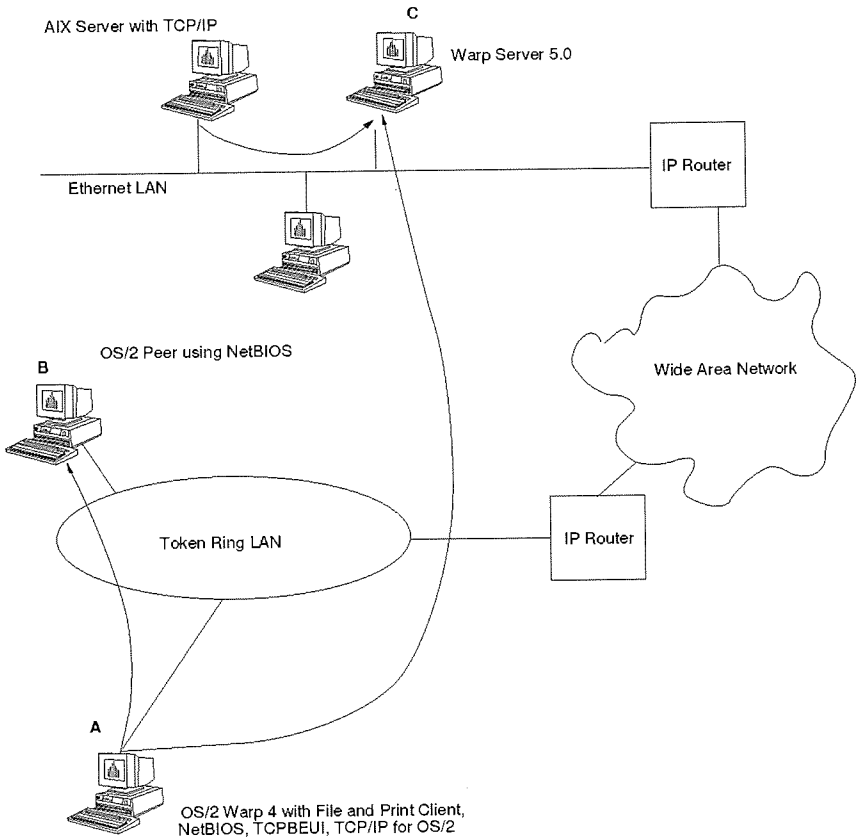


Figure 250. OS/2 Warp 4 Using Multiple Protocols

Figure 250 on page 463 shows an example scenario with native TCP/IP and NetBIOS protocols, as well as TCPBEUI, being used. In this example, workstation A is able to access peer services resources on workstation B on the local LAN segment via NetBIOS and the Warp Server on the remote LAN segment across the TCP/IP network via TCPBEUI and, in addition, is able to use native TCP/IP applications to access other TCP/IP resources on an AIX server with the native TCP/IP protocol.

When configuring MPTS for both NETBEUI and TCPBEUI, the two protocols need to be configured on different logical adapters, even though only a single network adapter is

present. The Current Configuration window in the MPTS utility should be adapted as follows:

```
IBM Token-Ring Network Adapter ...
  0  - IBM OS/2 NetBIOS
  0  - IBM IEEE 802.2
  0  - IBM TCP/IP
  1  - IBM OS/2 NetBIOS OVER TCP/IP
```

Figure 251. LAPS Configuration Panel

Note that the numbers for the protocol drivers must be set differently, although only one physical network adapter is present.

The MPTS utility will modify CONFIG.SYS to include the TCPBEUI protocol driver alongside the other drivers, and will include a separate section for TCPBEUI in PROTOCOL.INI, as shown in Figure 252 on page 464.

```
    :
    :
[tcpbeui_nif]

   DriverName = tcpbeui$
   Bindings = ,IBMTOK_nif
   OS2TRACEMASK = 0x0
   SESSIONS = 130
   NCBS = 225
   NAMES = 21
   SELECTORS = 15
   USEMAXDATAGRAM = "NO"
   NETBIOSTIMEOUT = 500
   NETBIOSRETRIES = 2
   NAMECACHE = 0
   PRELOADCACHE = "NO"
   NAMESFILE = 0
   DATAGRAMPACKETS = 20
   PACKETS = 50
     :
     :
```

Figure 252. PROTOCOL.INI - TCPBEUI

When configuring peer services and the requester service, OS/2 Warp 4 handles this configuration as if there were two network adapters present. The IBMLAN.INI file, which contains the network configuration data for these services, will therefore appear as follows:

```
[networks]

net1 = tcpbeui$,0,LM10,102,175,14
net2 = NETBEUI$,1,LM10,102,175,14


[requester]

wrknets = NET1,NET2

[server] srvnets = NET1,NET2
```

Figure 253. Extract from IBMLAN.INI. NetBIOS and TCPBEUI bound to a single network adapter

5.8.3.2 Performance Considerations for TCPBEUI

When using TCPBEUI, overall network performance is generally slower than when using native NetBIOS, due to the additional overhead of mapping NetBIOS API calls to the TCP/IP protocol. The performance difference can vary widely depending on the environment. Some factors that can affect performance are:

- Type of client (OS/2 or DOS)
- Server CPU workload
- Type of network operations being performed
- Network media
- Network congestion
- Communication line speeds

During performance tests we conducted on a 16 Mbps token-ring network with no WAN connections, we used a set of industry-standard business applications on TCPBEUI clients and again on native NETBEUI clients. In this environment, TCPBEUI was 20% slower than NETBEUI.

Because there may be a performance difference in a particular environment, we recommend that you configure and use NETBEUI in a single-segment local LAN environment, and use TCPBEUI in a routed or WAN environment. MPTS allows you to configure both protocols on a single network adapter, and to have peer services and the requester service use both protocols concurrently (see 5.8.3.1, "Coexisting with Native NetBIOS or TCP/IP" on page 462).

5.8.3.3 Tuning Considerations for TCPBEUI

When using TCPBEUI in a token-ring environment, file transfer performance can be improved by increasing the **maximum transmissible unit** (**MTU**) size. Tests showed up to 20 percent performance increases for large file transfers by using an 8 KB packet instead of the default 1500 bytes (the default setting was chosen because of Ethernet's packet size limitations and the prevalence of Ethernet LANs in TCP/IP installations).

You can change the MTU size by including an IFCONFIG command in the SETUP.CMD file for TCP/IP. Set the MTU size to the desired packet size plus 40 bytes (the maximum TCP/IP header size). The desired packet size should be a multiple of 2048. Your network adapter must be configured to support transmission of buffers that are at least the size specified for the MTU. On an IBM 16/4 Token-Ring Adapter, this would be accomplished by setting the `XMITBUFSIZE` parameter in the `IBMTOK_NIF` section of the PROTOCOL.INI file. Check your network adapter documentation for information on configuring your adapter.

We recommend that you use the INETCFG command to change the default *keepalive* value from the default of 120 minutes to a lower value. For example:

```
inetcfg keepalive=10
```

The reason for this recommendation is that, with the default setting, a TCPBEUI server is *not* informed of a TCP/IP connection breaking for a period of two hours. Thus, a TCPBEUI server could accumulate a large number of *ghost* sessions. By issuing `inetcfg keepalive=10`, TCP/IP will inform TCPBEUI after 10 minutes that a TCP/IP connection is broken (that is, a remote client has gone down).

If you are experiencing difficulties accessing a remote server over a slow WAN connection, try gradually increasing the `NetBIOSTIMEOUT` parameter in PROTOCOL.INI. However, be aware that if `NetBIOSTIMEOUT` is set too high, some local LAN functions, such as logon and NET USE, may take significantly longer.

5.8.4 How to Reduce Broadcast Frames Using TCPBEUI

TCPBEUI supports the use of routing extensions and a name cache. These features enable you to reduce TCP/IP broadcast frames on your network, and improve overall network performance. This section discusses these topics and also gives you information on how to use an existing domain name server in a TCPBEUI environment.

5.8.4.1 Routing Extensions

TCPBEUI provides a series of features called *routing extensions*. These extensions allow communication between networks and over IP routers and bridges. The routing extensions are:

- The names file, which contains pairs of NetBIOS names and IP addresses.

  When attempting to locate a NetBIOS name, TCPBEUI will conduct a prefix search of the names file before broadcasting on the network. The prefix match succeeds if the entry in the names file matches the given name, up to the length of the entry. The first match is used; therefore, the order in which NetBIOS names are listed in the names file is important.

  To use this routing extension, set the `NAMESFILE` parameter in the `TCPBEUI` section of the PROTOCOL.INI to a nonzero integer that represents the number of names file entries

- The domain name server, where a network administrator can maintain NetBIOS names and IP addresses.

  If a name query fails, TCPBEUI can append the NetBIOS Domain Scope String to the encoded NetBIOS name and request the domain name server to look up an IP address for that NetBIOS name.

  The Domain Scope String is defined by the PROTOCOL.INI parameter `DOMAINSCOPE`. For more information on how to use this parameter and how to set up the name server with NetBIOS names, see 5.8.4.3, "Storing NetBIOS Names on the Domain Name Server."

- The broadcast file, which contains a list of host names, host addresses, or directed broadcast addresses.

  This file is read at system startup and each valid address is added to the set of destination addresses for broadcast packets.

  Use of a broadcast file has the effect of extending a node's broadcast domain to its own subnet plus any other subnets listed in the broadcast file. If your routers support directed broadcasts (that is, you can ping the broadcast address of a distant IP subnet, and get back a response from all the stations on that subnet), you can place the broadcast address for each subnet in the server's broadcast file.

  Remote nodes included in the broadcast file are treated as if they were on the local network. A maximum of 32 broadcast file entries are supported, each of which could include additional subnets, thus extending the node's broadcast domain.

5.8.4.2 Name Cache

TCPBEUI provides a *name cache* for storing remote host names that have already been discovered and mapped to IP addresses. Since TCPBEUI uses broadcasting as a mechanism for name discovery, broadcast traffic is reduced by first checking the name cache The name cache is enabled by setting the `NAMECACHE` parameter in the `TCPBEUI` section of the PROTOCOL.INI to a nonzero integer that represents the number of names stored in the directory (`NAMECACHE=xx`).

The information in the name cache is stored on disk and periodically updated. When the system is restarted, this information can be preloaded into the cache at boot time. Preloading can further reduce the incidence of broadcast traffic on the network, since NetBIOS will not have to rediscover names for remote workstations. To preload the name cache, set `PRELOADCACHE=YES` in the `TCPBEUI` section of PROTOCOL.INI.

TCPBEUI uses the following name discovery algorithm when searching for a name:

1. Check the name cache
2. Check the names file
3. Issue a GetHostByName() command to the domain name server
4. Check the TCPIP\ETC\HOSTS file
5. Issue a broadcast frame using the broadcast file's entries

Each of the above methods is tried in turn until the name is found.

We recommend that, when running NetBIOS over TCP/IP in a wide area network (WAN), you should turn name caching on at the server (NAMECACHE=100).

5.8.4.3 Storing NetBIOS Names on the Domain Name Server

In a large network where a domain name server already exists, you can use the domain name server database to store NetBIOS name/IP address pairs, thereby eliminating the need for maintaining a broadcast file or names file on each computer in your network. In each computer's PROTOCOL.INI file, you must ensure only that the DOMAINSCOPE parameter is set to the TCP/IP domain name. TCPBEUI will then search that domain's name server for the IP address of the requested server.

Notes:

1. The solution described in this section assumes that the system to which you wish to connect is already set up as a TCP/IP node with a host name/IP address pair in the domain name server database.
2. If you do not have a domain name server, you can set up the local node's HOSTS file (\TCPIP\ETC\HOSTS) in the same way we describe here. That is, NetBIOS names must be encoded in the hosts file just as they must be in the domain name server. TCPBEUI will first look for the requested server IP address in the name server. If the name server does not exist or the address is not specified in the name server, TCPBEUI checks the local hosts file.

The NetBIOS names must be added to the domain name server database in an *encoded* format. The encoding is necessary because NetBIOS names are 16 bytes of *any* bit pattern and a TCP/IP domain name server accepts only host names in the character set *A to Z* and *0 to 9*.

For example, if you have specified DOMAINSCOPE=austin.ibm.com in the PROTOCOL.INI file and the NetBIOS name you have requested is not found in the local names cache or the local names file, then a sockets GetHostByName(netbios_name.austin.ibm.com) call will be made. TCPBEUI translates the 16-byte NetBIOS name into a 32-byte reversible, half-ASCII based encoded format, such as:

```
GetHostByName(GCHCGJGDGFCACACACACACACACACACA.austin.ibm.com)
```

and sends it to the name server. If the name server knows this name, it returns the IP address to TCPBEUI. For this method to work, the administrator must store the NetBIOS names in the name server in the encoded format.

You can encode NetBIOS names and store them in the domain name server database using the MAPNAME utility. Once encoded, you can store the names in the database so that they point back to the original host name, where the TCP/IP address is already listed. We will use an example to illustrate the entire process.

For each server, there will be at least three entries in the domain name server database in addition to the initial host name entry. (Remember, we are assuming that the LAN Server is already set up as a TCP/IP host, with a host name/IP address pair that is

registered in the domain name server database.) The three entries are necessary because LAN Server issues a NetBIOS NCB.AddName call three times, using the computername specified in the IBMLAN.INI file and ending each with a unique hex value as the sixteenth byte. The hex values used as the sixteenth byte are 0x20 (blank or null), 0x00, and 0x03. If the server is a domain controller, there must be a fourth entry, the encoded domain name with the sixteenth byte of 0x00.

Let us assume that you have a domain name server already set up on your network. We have installed OS/2 Warp Server on the domain controller and one additional server. Both servers also have TCP/IP installed, and their host names are registered in the domain name server database. We want to configure TCPBEUI so that requesters can access servers across an IP router without requiring a broadcast file or names file in each client system. To do this, we will take advantage of the name server, and add the appropriate `DOMAINSCOPE` entry to each computer's PROTOCOL.INI file.

For this example, the domain name is ITSCAUS, and the two servers are configured as follows:

Domain controller Computername: ITSCSV00
TCP/IP host name: ITSCWK00

Additional server Computername: ITSCSV01
TCP/IP host name: ITSCWK01

Note: The computername refers to the IBMLAN.INI parameter. This is also referred to as the server name or machine ID.

Below is an extract from the database *before* we add the encoded NetBIOS names:

```
ITSCWK00                    86400  IN  A      129.35.144.210
                                   IN  \HINFO  DC HOST NAME

;
ITSCWK01                    86400  IN  A      129.35.144.211
                                   IN  HINFO  AS HOST NAME

;
```

Figure 254. Sample Domain Name Server Database File before Adding Encoded NetBIOS Names. The TCP/IP host names are listed with the workstation IP addresses.

The `HINFO` keyword specifies comment information. In this case, we have indicated that ITSCWK00 is the TCP/IP host name for the domain controller, and ITSCWK01 is the host name for the additional server. TCP/IP looks up the host name in the domain name server database and finds the actual IP address.

Now we want to use TCPBEUI and take advantage of the domain name server database. To do this, we must encode the server NetBIOS names using the MAPNAME utility. Typing `MAPNAME` by itself will give you help on how to use the command. The

utility converts NetBIOS names to RFC-encoded names and vice versa. Using our example, the following steps show you how to encode your server NetBIOS names.

Note

When using MAPNAME, be sure to type the NetBIOS computername in uppercase letters, as this is a case-sensitive utility. If you type the computername in lowercase, the output will be incorrect.

1. Use MAPNAME with the /RB parameters to specify that you want the output to be in RFC format and padded with blanks for up to 16 characters.

   ```
   MAPNAME ITSCSV00 /RB
   ```

   The following 32-byte encoded name is displayed:

   ```
   RFC name: EJFEFDEDFDFGDADACACACACACACACACA
   ```

   This is the first of the four encoded names you need for the domain controller. Here, the sixteenth byte, CA, is null (0x20). The following command would have given us the same result, but since null characters are the default, the L20 is unnecessary.

   ```
   MAPNAME ITSCSV00 /RBL20
   ```

2. This time, also use the L parameter to specify that you want the last character of the output to be 0x00, as follows:

   ```
   MAPNAME ITSCSV00 /RBL00
   ```

   The result is:

   ```
   RFC name: EJFEFDEDFDFGDADACACACACACACACAAA
   ```

   AA is hex 0x00.

3. Again, use the L parameter to specify the last character of the output to be 0x03, as follows:

   ```
   MAPNAME ITSCSV00 /RBL03
   ```

   You receive this output:

   ```
   RFC name: EJFEFDEDFDFGDADACACACACACACACAAD
   ```

   AD is hex 0x03.

4. Because this is the domain controller, you must also specify the encoded domain name with the sixteenth byte of 0x00, as follows:

   ```
   MAPNAME ITSCAUS /RBL00
   ```

   The encoded name is:

   ```
   RFC name: EJFEFDEDFDFGDADACACACACACACACAAA
   ```

5. Now we go through the first three steps for the additional server, ITSCSV01, to get the following output (do not encode the domain name for additional servers):

```
MAPNAME ITSCSV01 /RB
RFC name: EJFEFDEDFDFGDADBCACACACACACACACA

MAPNAME ITSCSV01 /RBL00
RFC name: EJFEFDEDFDFGDADBCACACACACACACAAA

MAPNAME ITSCSV01 /RBL03
RFC name: EJFEFDEDFDFGDADBCACACACACACACAAD
```

6. Edit the domain name server database to add the entries for the domain controller and additional server. Use the domain name server CNAME keyword to point back to the host name entry for the machine where the actual IP address is already specified. In other words, the encoded names we have generated are *aliases* for the host names ITSCWK00 and ITSCWK01. You cannot have two entries pointing to the same IP address, so you must use the CNAME keyword to create aliases.

   The following example shows how our domain name server database file looks *after* adding the NetBIOS encoded names. Again, we use HINFO to designate comments.

```
ITSCWK00                                86400  IN  A      129.35.144.210
                                              IN  HINFO  DC HOST NAME

;
EJFEFDEDFDFGDADACACACACACACACACA 86400  IN  CNAME  ITSCWK00
                                              IN  HINFO  ITSCSV00 (0x20 in byte 16)

;
EJFEFDEDFDFGDADACACACACACACACAAA 86400  IN  CNAME  ITSCWK00
                                              IN  HINFO  ITSCSV00 (0x00 in byte 16)

;
EJFEFDEDFDFGDADACACACACACACACAAD 86400  IN  CNAME  ITSCWK00
                                              IN  HINFO  ITSCSV00 (0x03 in byte 16)

;
EJFEFDEDFDFGDADACACACACACACACAAA 86400  IN  CNAME  ITSCWK00
                                              IN  HINFO  ITSCAUS (0x00 in byte 16)

;
ITSCWK01                                86400  IN  A      129.35.144.211
                                              IN  HINFO  AS HOST NAME

;
EJFEFDEDFDFGDADBCACACACACACACACA 86400  IN  CNAME  ITSCWK01
                                              IN  HINFO  ITSCSV0I (0x20 in byte 16)

;
EJFEFDEDFDFGDADBCACACACACACACAAA 86400  IN  CNAME  ITSCWK01
                                              IN  HINFO  ITSCSV01 (0x00 in byte 16)

;
EJFEFDEDFDFGDADBCACACACACACACAAD 86400  IN  CNAME  ITSCWK01
                                              IN  HINFO  ITSCSV01 (0x03 in byte 16)

;
```

Figure 255. Sample Domain Name Server Database File after Adding Encoded NetBIOS Names. The encoded NetBIOS names point back to the TCP/IP host names (using CNAME), where the workstation IP addresses are specified.

For the domain controller (ITSCSV00), there are four encoded entries, three for the server name (computername) and one for the domain name (ITSCAUS). For the additional server (ITSCSV01), there are three encoded entries for the server name. The encoded entries are all aliases that point back to the host names.

7. On your clients, be sure that you set the `DOMAINSCOPE` parameter to point to the correct TCP/IP domain, for example, `DOMAINSCOPE=austin.ibm.com`. This enables TCPBEUI to use the domain name server to find the NetBIOS name/IP address pairs, eliminating the need for a broadcast file or names file at each client.

5.8.4.4 Removing a TCPBEUI Configuration

When removing a TCPBEUI configuration from MPTS, you must first remove TCP/IP Socket Access at the Configure panel (see Figure 245 on page 449), before proceeding to the LAPS Configuration panel and removing the TCP/IP protocol and the NetBIOS over TCP/IP protocol.

If you do not carry out these steps in order, the protocols will be removed from the PROTOCOL.INI file but the MPTCONFG.INI file will not be updated properly. This will result in invalid device drivers being added to the CONFIG.SYS file.

5.8.5 Novell NetWare Client

The Novell NetWare Client component of OS/2 Warp 4 runs in a similar way to other networking components. You may use it to access resources on NetWare servers while you are concurrently using the peer services, requester service or TCP/IP components to access resources on other types of server.

Novell and Apple have created their own alternative to the NDIS standard, known as the *Open Data-Link Interface* (*ODI*). The ODI interface uses a protocol driver similar to that used by NDIS, and a *Multiple Link Interface Driver* (*MLID*), which is similar in concept to an NDIS adapter driver.

By default, the Novell NetWare Client would normally run on an ODI stack. The normal NetWare protocol driver is IPX, for which there is no NDIS protocol driver available. However, it is not possible to have both an NDIS adapter driver and an ODI MLID loaded simultaneously for the same adapter. It is not possible, for example, to run the Novell NetWare Client on a full ODI stack and peer services on an NDIS stack at the same time.

To overcome this problem and run the Novell NetWare Client over the NDIS interface, IBM developed a special driver named ODI2NDI (ODI to NDIS). ODI2NDI provides an interface to the ODI stack, so that the NetWare protocol drivers are able to use the NDIS interface and to coexist with NDIS protocol drivers. Figure 256 shows the protocol stacks in use when the Novell NetWare Client is coexisting with the File and Print Client.

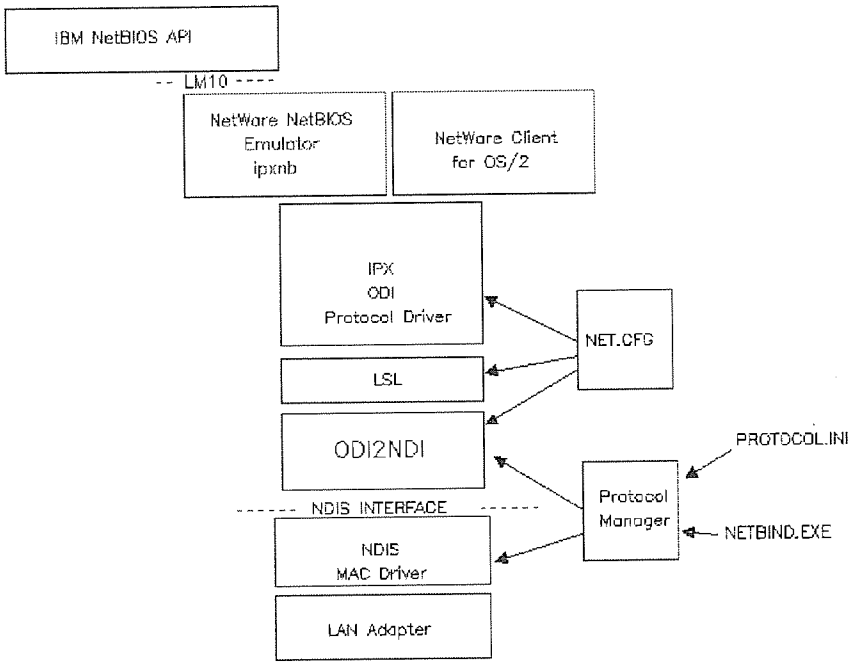


Figure 256. NetWare Requester in a Multiprotocol Environment

Note that the ODI2NDI driver, which appears to the NDIS interface as a protocol driver, appears to the ODI stack as an adapter driver (MLID). ODI2NDI therefore provides a translation between the two interface standards.

When you select **NetWare Requester Support** from the LAPS Configuration panel in the MPTS utility, the ODI2NDI driver is loaded and configured, just like any protocol driver.

5.8.5.1 Installing the Novell NetWare Client

When installing the Novell NetWare Client as part of the OS/2 Warp 4 installation process, the Novell NetWare Client typically must coexist with one or more networking components that use the NDIS protocol stack (unless you are using the Easy installation option) and the Novell NetWare Client is the only networking component you are installing. Because of this, the OS/2 Warp 4 installation procedure will automatically

install and configure the ODI2NDI driver for you. Figure 257 shows the additional section added to PROTOCOL.INI the ODI2NDI driver.

```
[PROT_MAN]

   DRIVERNAME = PROTMAN$

[IBMLXCFG]

   NETBEUI_NIF = NETBEUI.NIF
   IBMTOK_NIF = IBMTOK.NIF
   ODI2NDI_NIF = ODI2NDI.NIF


[NetBIOS]

   DriverName = netbios$
   ADAPTER0 = netbeui$,0

[NETBEUI_NIF]

   BINDINGS = IBMTOK_NIF
   DriverName = netbeui$

[ODI2NDI_NIF]

   NETADDRESS = "10005A88B1C9"
   BINDINGS = IBMTOK_NIF
   DriverName = odi2ndi$
[IBMTOK_NIF]

   DriverName = IBMTOK$
```

Figure 257. ODI2NDI Configuration - PROTOCOL.INI

Clicking on **OS/2 System=> System Setup=> Install/Remove=> Selective Install for Networking** will also install the ODI2NDI driver and put the adapter address in the PROTOCOL.INI automatically if you decide to install the Novell NetWare Client *after* you have installed the other networking applications that normally use MPTS (for example, File and Print Client, TCP/IP for OS/2). If you use locally administered addresses, you will be given an opportunity to edit MPTS.

If you decide to install the Novell NetWare Client from diskettes (which could have been created from PRODDSKS.CMD utility on the OS/2 Warp 4 CD-ROM) or even a diskette version of the requester that is not part of OS/2 Warp 4 (for example, NetWare Client for OS/2 2.11), you must follow this procedure to install the ODI2NDI driver correctly:

1. Install all of the normal OS/2 networking products, such as File and Print Client, TCP/IP for OS/2, Communications Manager and DB2/2 (the latter two are not part of OS/2 Warp 4) that use the Multiple Protocol Transport Services. Make sure MPTS is installed and configured for these products as well. The normal install of OS/2 Warp 4 will do this for you (the only difference is not selecting the Novell NetWare Client). Reboot and test the machine to see that these are working.

Remote Access Client

If you are going to use the Remote Access Client, do not install it at this stage (see 5.9.4, "Installing the Remote Access Client" on page 487 for details on why). Just install the NetBIOS protocol in MPTS that the Remote Access Client needs.

2. Install the Novell NetWare Client as normal - when it asks you the ODI driver name, you can accept the default because this driver will not be used. *Important! Do NOT reboot the machine after installing the Novell NetWare Client.*
3. Select **OS/2 System =>System Setup => MPTS**. Select **OK**, then **Configure**, then the **LAN Adapters and Protocols** radio button. Click on **Configure**. You should now be in the Adapter and Protocol Configuration panel.
4. From the Protocol list, select **IBM NetWare Requester Support** and click the **Add** button. This should install the protocol driver ODI2NDI on the Current Configuration panel.
5. Highlight the **IBM NetWare Requester Support** and click on **Edit**.
6. In the Network Adapter Address field, put the the burnt-in address or the locally administered adapter address. If you do not know the burnt-in address or cannot find it, you can get it by looking in the IBMCOM\LANTRAN.LOG file. The address will be at the end: `Adapter 0 is using node address 487E5C62F29A`. If you have a token-ring adapter, put a T in front of the address. If you have an Ethernet adapter, put an I (for example, T487E5C62F29A or I487E5C62F29A).
7. Save these settings and exit MPTS through the various panels.
8. Reboot the workstation. You should now be able to access use your normal networking applications *and* access the NetWare Server at the same time.

5.8.5.2 NetWare NetBIOS Emulation over IPX

Novell has produced a NetBIOS emulator facility (IPXNB), which is provided with the Novell NetWare Client. You can use MPTS to configure this utility, and have NetBIOS applications communicate over the LAN using the IPX protocol.

IPXNB provides an LM10 NetBIOS interface, similar to that provided by NETBEUI and TCPBEUI. This interface can be used by NetBIOS applications such as peer services or the requester service, allowing these applications to communicate using the IPX protocol. This capability is extremely useful if you have multisegment networks connected by IPX routers, or if you already use IPX as the standard protocol on your network and do not wish to introduce additional protocols.

Figure 258 shows systems running peer services on a routed Novell NetWare network. In this example, each computer is able to access resources on each other, as well as being able to access resources on the NetWare server using the Novell NetWare Client.

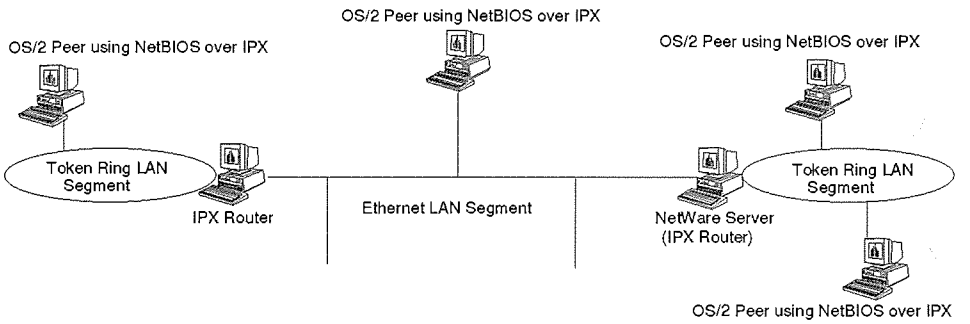


Figure 258. Using Peer Services on an IPX Network

5.8.5.3 Configuring NetWare NetBIOS Emulation

When installing the Novell NetWare Client, select **Optional Protocols**, and be sure that you select **NetWare NetBIOS emulation**, since the default installation does not install IPXNB.

To configure IPXNB, start the Install program from the Novell folder, then select **Configuration** from the menu bar and **This Workstation** from the resulting pull-down menu. Accept the default path for the NET.CFG file.

Select **Edit** to display the editing panel as shown in Figure 259.

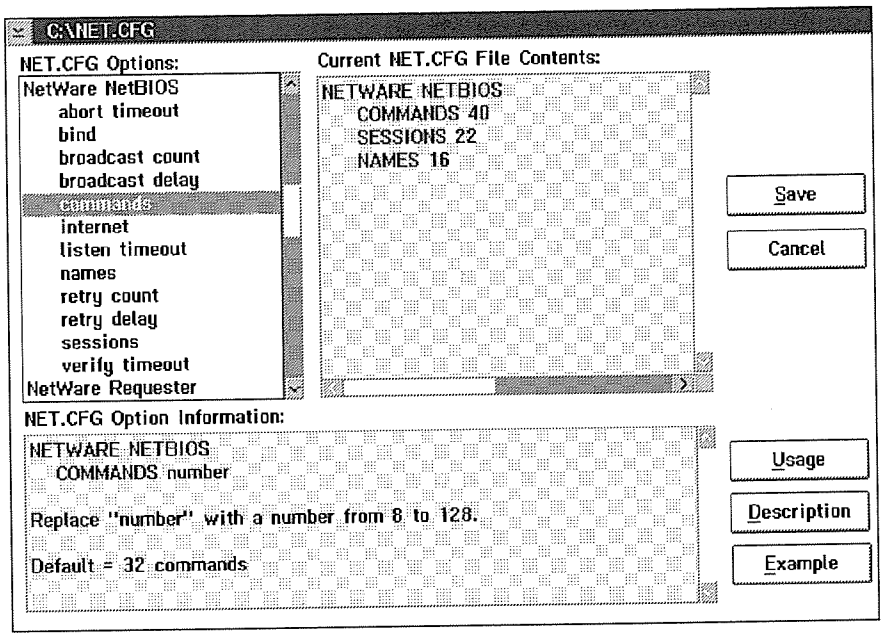


Figure 259. NetWare Requester Configuration Panel

Find the NetWare NetBIOS entry in the list at the top left, and select this entry.

The parameters that apply to IPXNB will be displayed in the box at the top right. Make the appropriate changes to the NetBIOS resource parameters according to the NetBIOS resources needed to run your applications. When you have completed your changes, save the configuration and close the Install utility.

Start the MPTS utility and select the **Configure** button. Select the **LAN Adapters and Protocols** radio button, then select the **Configure** button.

Select the correct network adapter, then select the following protocols from the list at the top right:

- IBM NetWare Requester Support
- NetWare NetBIOS Emulation over IPX

The MPTS utility adds sections to PROTOCOL.INI that configure IPXNB and the ODI2NDI driver, as shown in Figure 260.

```
    :
    :
[ipxnb_nif]

   DriverName = ipxnb$
   Bindings = IBMTOK_nif

[odi2ndi_nif]

   DriverName = odi2ndi$
   Bindings = IBMTOK_nif
   NETADDRESS = "10005A88B1C9"
   TOKEN-RING = "yes"
   TOKEN-RING_SNAP = "yes"
   ETHERNET_802.3 = "no"
   ETHERNET_802.2 = "no"
   ETHERNET_II = "no"
   ETHERNET_SNAP = "no"
   TRACE = 0x0
     :
     :
```

Figure 260. PROTOCOL.INI with IPXNB Configured

When you have added the protocols to your network adapter in the LAPS Configuration window, select the **OK** button to save the configuration, and exit the MPTS utility.

5.8.5.4 NetBIOS Emulation As the Default Protocol

When you install OS/2 Warp 4, File and Print Client services and the requester service are automatically configured to use the NetBIOS protocol. To change this configuration, and use NetBIOS emulation over IPX, you need to perform some manual configuration.

First, ensure you have installed and configured IPXNB using the Install utility in the Novell folder, as described in 5.8.5.3, "Configuring NetWare NetBIOS Emulation" on page 476. Then follow these steps:

1. Start the MPTS utility, and select the **Configure** button.
2. Select **Network Adapter and Protocol Support** and select the **Configure** button.
3. Remove the IBM OS/2 NetBIOS driver from the Current Configuration window.
4. Add the NetWare NetBIOS over IPX protocol from the Protocols window at the top right.
5. Select **OK** to save your configuration, and exit the MPTS utility.

Your computer is now configured to use IPXNB as the default protocol. However, you must still tell peer services or the requester service to use the IPXNB interface instead of the NETBEUI interface. To do this, follow these steps:

1. Select **Install/Remove** in the System Setup.
2. Click on **File and Print Client Install/Remove**.
3. On the Installation Tasks panel select **Configure this workstation**.

4. Pass through *all* the subsequent panels without making any changes. The utility will automatically detect that IPXNB is the only network protocol, and configure itself accordingly.

Shut down and reboot your computer. You will then be able to start the peer services or the requester service using the NetBIOS over IPX protocol.

5.8.5.5 Limitations of IPXNB

An application using IPXNB cannot communicate with another application using native NetBIOS. Even if applications are written to the NetBIOS programming interface, IPX protocol stacks cannot talk with NetBIOS protocol stacks. The computer or application with which you wish to communicate must use the same protocol stack.

5.8.5.6 Performance Considerations

The NetBIOS emulation in the Novell NetWare Client is provided by the NetBIOS.SYS driver. The NetBIOS provided by Novell does not transmit NetBIOS packets on the network. Instead, NetBIOS packets are *encapsulated* in IPX packets, and the IPX packets are transmitted. The encapsulation process will impact performance of peer services or the requester service.

You should remember that the NetBIOS over IPX protocol does not have the same enhancements that have been specifically designed for routed networks as are available in the NetBIOS over TCP/IP protocol (see 5.8.4, "How to Reduce Broadcast Frames Using TCPBEUI" on page 466). Using IPXNB will likely result in reduced performance compared to NetBIOS over TCP/IP.

5.9 Remote LAN Access

OS/2 Warp 4 allows you to access a local area network from a remote computer using a dial-up link and connection server, and run your LAN applications as though your computer were directly attached to the LAN. You can also access another remote computer's resources without the need of a connection server. These types of environments are generally referred to as WANs or wide area networks, which go beyond the physical bounds of local area networks.

Any of the OS/2 Warp 4 networking components such as the File and Print Client, the Novell NetWare Client or TCP/IP Services can be used in this environment. The component of OS/2 Warp 4 that provides this remote access capability is known as the Remote Access Client. It is also known as the LAN Distance client. We will refer to both where appropriate.

The Remote Access Client allows you to access network resources on LANs that may be anywhere in the world. As long as you have a computer with a modem and access to a telephone line, you can dial up a LAN and use its network resources as though your computer were directly connected to the LAN.

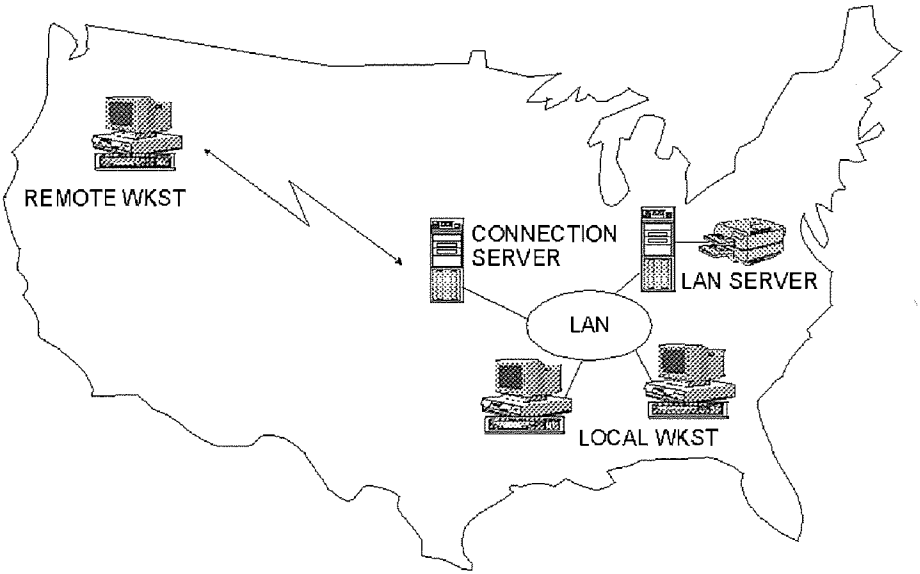


Figure 261. Remote Access Overview

In Figure 261 on page 480, you can see how remote access works. The Remote Access Client in your OS/2 Warp 4 system allows you to dial up to another computer that is attached to the network. This computer is known as a *connection server*, and runs either OS/2 Warp Server with the connection server component installed and running or the IBM LAN Distance Connection Server. Both of these are actually the same product except that LAN Distance Connection Server is now included as part of IBM Warp Server.

Note: You need the connection server on the LAN to which you want to connect, in order to use remote access on your OS/2 Warp 4 system.

The connection server acts as a bridge, allowing you to connect to the LAN and access network resources. These resources may reside on any computers on the LAN, not just the connection server itself. For example, you could use remote access to provide a TCP/IP connection, enabling you to connect to a UNIX system on the LAN and logon using the TELNET application.

As well as providing the LAN connection, the connection server also provides a number of security facilities. Obviously, it is not a good idea to let just anyone connect to your LAN, so the connection server includes facilities to authenticate users attempting to connect. Only after you are properly identified to the connection server will you be allowed to connect to the LAN and access network resources. See 5.9.5.1, "Security" on page 489 for more information on the security feature of remote access.

5.9.1 Supported LAN Protocols and Applications

The Remote Access Client allows you to dial up using any of the following types of connection:

- Asynchronous
- Synchronous
- ISDN (basic rate switched connection)
- X.25 (through asynchronous modems with packed assembler/disassembler capabilities)

You can use the Remote Access Client to connect to Ethernet or token-ring networks.

You can use the Remote Access Client to run any LAN applications that work with t he Network Driver Interface Specification (NDIS), or which use a network transport protocol that is NDIS-compliant. Provided your applications or their protocols support NDIS, you can run your LAN applications unchanged, using the Remote Access Client to make the LAN connection for you.

NDIS-compliant transport protocols provided with OS/2 Warp 4 are:

- IEEE 802.2
- NetBIOS
- TCP/IP
- TCPBEUI

These protocols are all included as part of the Multiple Protocol Transport Services (MPTS) component of OS/2 Warp 4. See 5.6, "Mobile Office" on page 412 for details. All of the networking components supplied with OS/2 Warp 4 use one or another of these protocols, so you can therefore use any of OS/2 Warp 4's networking components for remote access.

Note that the IPX protocol, used with the Novell NetWare Client, is not NDIS-compliant. However, MPTS includes an ODI-to-NDIS (ODI2NDI) translation layer that enables you to use the Novell NetWare Client in conjunction with the Remote Access Client to connect to a NetWare Server remotely.

You can use a single connection to run more than one network application, and more than one protocol. The multiprotocol support provided by MPTS is present when running network transport protocols using the Remote Access Client.

Many other LAN-based applications use protocols supported by the Remote Access Client. Client/server applications are particularly well-suited to a remote access environment. Some applications and communications products you can use on your OS/2 Warp 4 system in conjunction with remote access are:

- IBM Database 2 OS/2

- Lotus Notes
- CC:Mail
- Artisoft LANtastic
- IBM Time and Place/2
- IBM Person-to-Person/2
- IBM Communications Manager/2 features:
  - 3270 Emulation
  - 5250 Emulation
  - APPC/APPN
- IBM Personal Communications
- TCP/IP-based applications
  - FTP
  - Telnet
  - WEB Explorer

There are many other client/server applications that work over normal LAN systems and also work with the Remote Access Client.

5.9.2 Remote Access Environments

The Remote Access Client allows you to communicate in a number of different ways, in addition to simply dialing up to a remote LAN. You can use the Remote Access Client to provide:

- Remote-to-LAN connection

  A remote OS/2 Warp 4 system can establish a connection to a connection server on a LAN and become a "part" of the LAN. The single connection provides access to all of the systems and resources on the LAN, allowing the remote system to behave as if it too were physically attached to the LAN.

  This environment is useful when you require access to LAN resources from remote locations, such as at home or while traveling. You can call into your office LAN and run the same applications that you use when you are in the office.

- LAN-to-Remote connection

  A system attached to a LAN can request that the connection server initiates a connection with a remote OS/2 Warp 4 system running the Remote Access Client. For example, you could use this type of connection to send updated files from a central office to a number of systems in remote locations, by dialing out through the connection server and copying the file to each remote system in turn.

- Remote-to-Remote connection

  Two remote systems can connect to one another over an existing telephone line to form a *virtual* LAN. In this environment, the two systems behave as though they

were both connected to the same physical LAN, and each can access network resources on the other using tools such as the File and Print Client. You can also run other applications that use one of the supported LAN protocols, such as the FTP/PM application, to communicate between two remote systems.

The remote-to-remote environment is useful when you have two systems in remote locations, and one system requires direct access to resources located on the other. For example, you can use this configuration if you are travelling or at home, and need access to the system in your office. You can also use this configuration to provide LAN communications in a small, two-system office, instead of more expensive LAN cabling.

- Remote-to-Central (Stand-alone) Server (no LAN)

  The connection server component of IBM Warp Server or LAN Distance Connection Server can be installed as a stand-alone system, supporting up to 128 remote connections. You can install any other server program on the connection server, such as:

  - Peer Services
  - IBM Warp Server or IBM LAN Server
  - TCP/IP server applications
  - Communications Server for APPC client/server applications

  This configuration allows the connection server to provide a centralized file, print and application server for multiple remote clients, without the need for LAN hardware at all.

These four environments are shown in Figure 262.

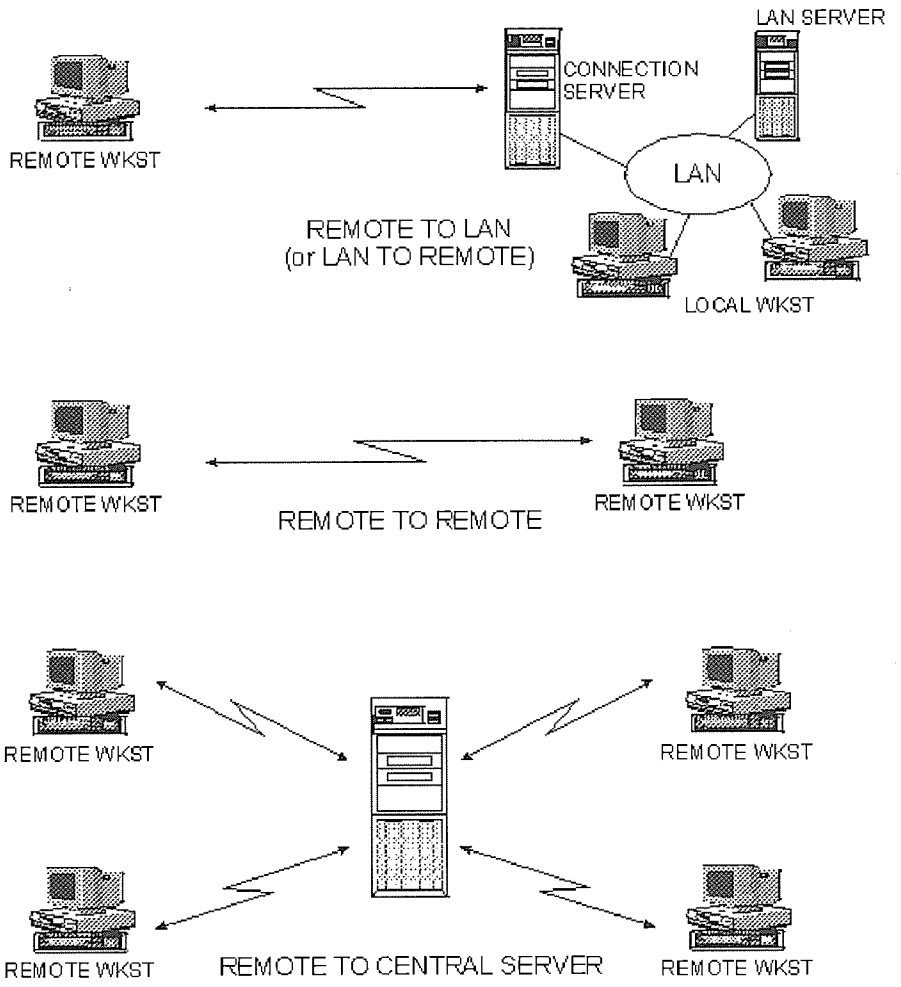


Figure 262. Remote Access Environments

How to Set Up a Remote-to-Remote Connection

To set up a basic remote-to-remote configuration, all you need to do is set up the answer mode to allow your workstation to be dialed by another workstation (although you may wish to set up user IDs and passwords in the Security tab to prompt remote users for a logon panel when they log on). To dial another workstation, you only need to configure the number in a PhoneBook entry tab. If you set up Remote Access Client to have two modems, you can have connections to two remote workstations at the same time, which in turn can be connected to other workstations. The File and Print Client will allow you to share resources between the two remote workstations. All workstations will see each other if you are using File and Print Client - this creates a *virtual* LAN. This type of connection does not require a LAN Distance Connection Server or Warp Server Connection Server.

A fifth connection option is possible, and worth mentioning here. You can use two connection servers to form a bridge between two LANs, allowing users on one LAN to access network resources on the other. This option requires that OS/2 Warp Server and the LAN Distance Connection Server be installed on both of the LANs, so further discussion is beyond the scope of this book.

5.9.3 Understanding the LAN Distance Shuttle Option: Remote versus LAN

If you take your OS/2 Warp 4 system with you when you travel, you might use it in a number of different ways:

- Directly attached to a LAN, perhaps via a docking station, while you are in the office.
- Remotely attached via the Remote Access Client and a telephone line, while you are at customers' offices or "on the road."

Since the Remote Access Client allows you to use only one type of connection (direct or remote) at a time, it is useful to be able to switch from a remote configuration to a LAN-attached configuration and back again.

OS/2 Warp 4 provides a *shuttle* feature as part of the Remote Access Client. This feature allows you to switch back and forth between remote and direct-attachment configurations, without needing to manually edit any configuration files. To use this option, you must have a network adapter installed in your OS/2 Warp 4 system, and a working LAN-attached configuration.

You can shuttle between LAN-attached and remote configurations by:

- Typing `LDSHUTTL` at a command line and pressing Enter

- Starting the Remote Access Client when the machine is configured as a LAN workstation
- Closing the Remote Access Client application on a system that is set up to operate as a remote client

Figure 263 on page 486 shows the Shuttle Option window, which is displayed whenever you perform any of the above steps.

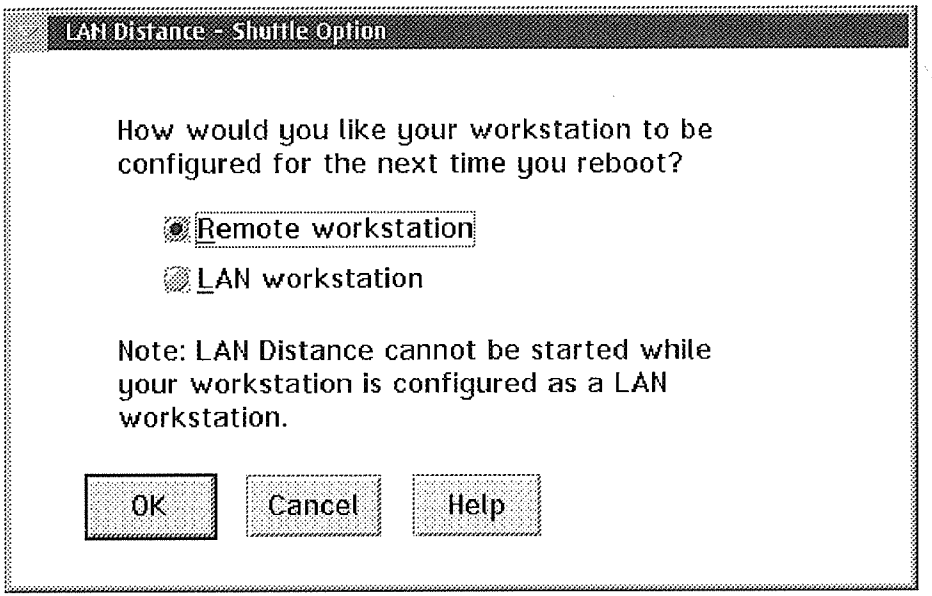


Figure 263. Remote Access Client - Shuttle Option

You can switch your OS/2 Warp 4 system between the two types of configuration (remote or LAN-attached) at any time.

When the shuttle feature changes your configuration, it changes both your CONFIG.SYS and PROTOCOL.INI files. The shuttle feature maintains two copies of the PROTOCOL.INI file: one for direct LAN attachment and one for remote attachment. Only one of these files is active at any time, while the other is backed up.

This means that if you make any changes to your network protocols using MPTS, you will modify only the currently active configuration. You will need to repeat these changes after you change configurations using the shuttle feature.

5.9.4 Installing the Remote Access Client

In most cases, you will install the Remote Access Client when you install OS/2 Warp 4, and most of the configuration work will be done for you (see "Installation of Networking Components"), though there are some exceptions as noted in 5.9.5, "Configuring User IDs and Security" on page 487. However, if you decide to install the Remote Access Client separately, you should be aware of some important factors.

The Remote Access Client sets up its network protocols during installation, using the information that you specified when you installed the various networking components of OS/2 Warp 4. If you install the Remote Access Client using the Selective Install for Networking utility after OS/2 Warp 4 installation, and then decide to install additional networking components later, the network protocols for these components will *not* automatically be added into your Remote Access Client configuration, and you will not be able to use those components remotely.

For this reason, we recommend that you install the Remote Access Client with all the networking components at the initial installation or after you have installed all other networking components. If you need to install additional networking components *after* you install the Remote Access Client, you should remove Remote Access Client (using the LDREMOVE command from the command line) and then re-install it after you have completed installing the networking components you require.

5.9.5 Configuring User IDs and Security

When you use the Remote Access Client for the first time after you install OS/2 Warp 4, you will need to do some configuration. You will need to set up your Remote Access Client account information, define your user ID for the Remote Access Client and set the security options to match those on the connection server to which you will connect.

For further information on installing and configuring the connection server, you should refer to the *LAN Distance 1.1 Advanced Guide* (supplied with IBM Warp Server), or the *LAN Distance Version 1.1 Configuration and Customization* book.

Note

You will be able to perform many of these tasks only if you are logged on to the Remote Access Client as a security administrator. In many corporate environments, your network administrator will set up and configure Remote Access Client for you.

Click on the **Connections** folder on your Workplace Shell desktop. Click on **Network=> Network Services**.

Double-click your left mouse button on the **Remote Access Client** icon to start the program. You must log on as a security administrator to configure the security options. To do this, follow these steps:

1. Select **Selected** from the menu bar.

2. Select **Logon**.

   The Logon window is displayed as shown in Figure 264 on page 488.

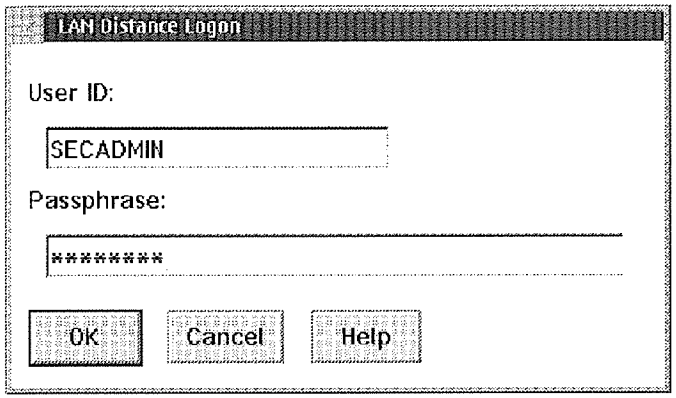


Figure 264. Remote Access Logon

3. Enter the default user ID you choose to assign during the Warp Server installation. If you did not assign your ID, the default user ID is SECADMIN.
4. Enter the passphrase you choose to assign during the Warp Server installation. If you did not assign a passphrase, the default passphrase is SECADIM. Note that the passphrase is case sensitive. You must enter the passphrase exactly as assigned. The default is SECADMIN in uppercase characters.
5. Select the **OK** button.
6. Remote Access Client will now display a message telling you that your passphrase has expired. Select the **OK** button.
7. The Change Passphrase window is presented, as shown in Figure 265.

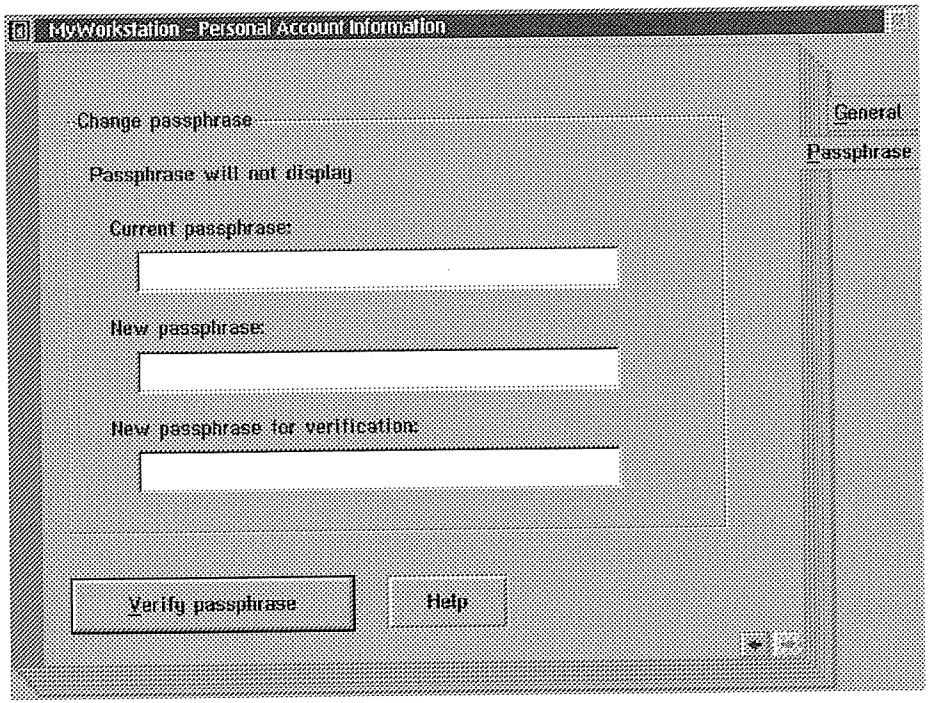


Figure 265. Changing Your Passphrase

8. In the Change Passphrase window:
   - Enter your new passphrase in the New Passphrase field
   - Enter the same passphrase again in the Verify Passphrase field
9. Select the **OK** button.

You are now logged on as a security administrator. You are now able to configure all Remote Access Client options.

Note

The length of your new passphrase must be greater than the default for minimum length as defined in your security policy (8 characters).

5.9.5.1 Security

Security is an important factor when you are accessing a network from a remote computer. You do not want just anyone to be able to log on and gain access to the information stored on your network. For this reason, OS/2 Warp 4's Remote Access

Client includes a number of security options that you can implement, or which your network administrator will implement for you.

When using the Remote Access Client, security applies to your own computer and to the connection server. You can apply the following types of security to your computer:

- You can force a user to provide a passphrase before they can log on and use remote access on your computer. See 5.9.5.4, "Security Options for Users" on page 492 for more information on passphrases. You can also define a security policy that defines the rules for passphrases, such as minimum length, maximum age, etc.
- You can implement callback security, which means that when another computer dials up to your computer, your computer calls back to ensure that they are dialing from an authorized telephone number.
- You can check the network address of the computer from which a user is dialing in, to ensure that it is a computer authorized to connect to your computer or network.
- You can restrict the logon intervals for a user, that is, the days and times at which they are allowed to connect to your computer or network.

You can implement any or all of these features on your OS/2 Warp 4 system, depending on the level of security that you want to implement. Each feature is described in more detail in 5.9.5.4, "Security Options for Users" on page 492.

To implement security features and make changes to the security definition on your computer, you must log on to remote access as a security administrator. See 5.9.5.2, "Types of Users" on page 490. While any user can log on to the Remote Access Client and turn on the security options, only a security administrator may turn off security or make changes to security definitions.

Note that turning security on or off is a local operation only, and cannot be performed remotely. That is, a security administrator must be physically located at the computer to turn the security subsystem on or off.

5.9.5.2 Types of Users

The Remote Access Client allows you to define three types of user:

- **Security administrators**

  Have the highest level of privilege. They may define new users, and set security and logon rules for users or for the entire computer/network.

- **Administrators**

  Can create new user definitions but cannot set security and logon rules for the entire Remote Access Client installation.

- **Users**

Can log on and use the Remote Access Client according to the rules defined for their user ID by a security administrator.

For information on how to set up user IDs of any type, see 5.9.5.9, "Adding a New User" on page 499.

5.9.5.3 Security Policy

A number of security options apply to the entire system rather than to individual user accounts. These options typically set the rules for validating logon attempts and user passphrases. The options you can set for passphrases are as follows:

- **Maximum Age**

  Users with passphrases are required to change their passphrases when the age of their current passphrase exceeds this time period.

  The user is not permitted to log on until a valid new passphrase has been submitted. The new passphrase does not take effect until the next logon (that is the current passphrase is used for the passphrase change session). The user is permitted to change his/her own passphrase prior to the passphrase's expiration time. The default expiration period is 30 days and a "no maximum" selection is available to disable automatic expiration.

- **Minimum Age**

  A security administrator can specify a time period during which a user is unable to change a recently established passphrase.

  The default time period is 0 days, which means that there is no restriction on when a user can change a newly assigned passphrase.

- **Minimum Length**

  A security administrator can establish the minimum passphrase length required for all user accounts. The minimum passphrase length can be from 4 to 32 characters.

  The default is 8 characters.

- **Passphrase History**

  A security administrator can specify that a history of from 0 to 8 prior passphrases be saved in the user's account. Whenever the user change their passphrase, the new passphrase is checked against these historical passphrases to ensure the new passphrase is not a duplicate of a recent passphrase. If a duplicate is found, the user is asked to submit another new passphrase.

  The default is 8 prior passphrases.

- **Maximum Logon Attempts**

  A security administrator can specify the maximum number of unsuccessful logon attempts that are permitted. A logon attempt can fail because:

  – An unknown user ID is submitted

- An inactive account is being accessed
- The passphrase is incorrect
- The user is calling from a workstation with a LAN adapter address that is invalid for the account
- The user is calling during a day of the week or a time of the day that is invalid for the account

The maximum number of logon attempts defaults to 4.

If the maximum number of logon attempts is exceeded, the user's account is automatically marked as inactive. In order to log on in the future, the user must contact the security administrator to have the account reactivated.

5.9.5.4 Security Options for Users

You can implement a number of different security options on your computer to prevent unauthorized access. Each of these options is described in the following sections.

Password Phrases (Passphrases): The simplest method of restricting access is to use a password. However, simple password protection methods can be broken relatively easily. Remote access therefore uses a more sophisticated method called the passphrase.

Up to 32 case-sensitive characters can be used to build individual tokens that comprise a passphrase. The passphrase is one-way encrypted using a hash algorithm. The resulting password key is 8 bytes in length.

Callback Security: Remote access supports an optional callback feature for remote computers. When you use remote access to dial another computer or a connection server, the callback feature causes that computer to hang up and dial back to your modem, ensuring that you are calling from a telephone number that is authorized for your account.

Figure 266 shows the sequence of operations in a general callback procedure.

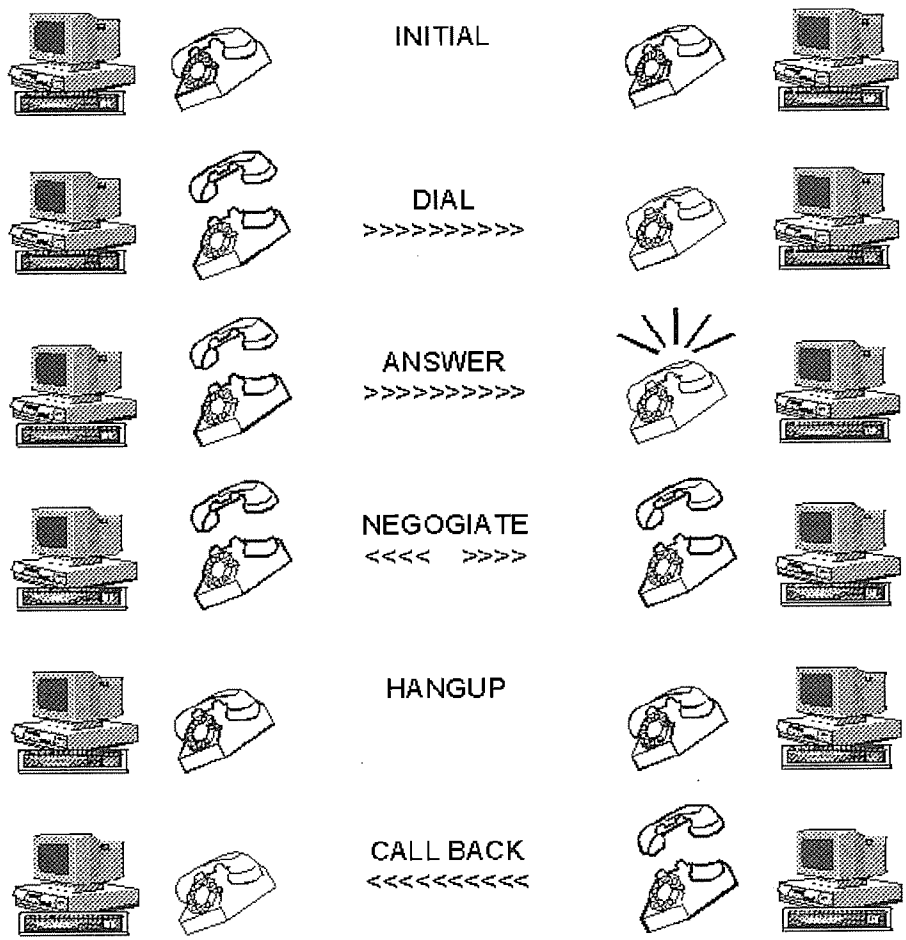


Figure 266. Callback

The callback feature can be individually configured for each user account, in the following ways:

- **Callback not required**

  This user will never be called back by the called computer

- **Fixed callback**

  This user is called back at a specific telephone number set in the user's definition at the called computer

- **Variable callback**

This user is asked to enter a telephone number as part of the logon procedure. The called computer then uses that telephone number for the callback.

When using the callback feature, the caller is authenticated twice. The first authentication (based on user ID and passphrase) is done prior to callback. This prevents harassment calls. The second authentication is done after callback, again based on user ID, passphrase and any other security options implemented for that user. This guards against known hacker techniques that can normally only be avoided using special telephone equipment or service options.

The callback feature can be useful if reversal of telephone charges is needed. For example, the majority of the charges for a call from a hotel room can be charged to your business telephone account instead of your hotel bill.

Note that the callback feature is used *only* when a connection is made from a remote client computer. It is not used when two connection servers communicate with one another (for LAN bridging).

Workstation Address Identification: A security administrator can configure up to eight network addresses when defining a user account. These addresses define computers from which that user is permitted to dial up and use remote access.

When a user connects to your computer or to a connection server, the address of the computer from which the user is dialing is checked as part of the user authentication process on your computer or on the connection server. If the address does not match one of the specified addresses in the user's definition, the logon attempt is rejected.

If the security administrator does not specify any addresses when defining the user, no checking is performed.

Valid Logon Intervals: A security administrator can configure the days and the times during those days that a user is allowed to log on. If a logon attempt is made at a time that is not within the time intervals specified, the attempt fails.

The default logon interval is 00:00 hours Sunday to 24:00 hours Saturday, that is, no restriction.

5.9.5.5 Turning on Security

Before the security options can be used, you must first turn them on. To do this, follow these steps:

1. Click on the **Remote Access** with your right mouse button and select **Settings** from the pop-up menu.
2. Select the **Security** tab from the notebook. The following window is displayed:

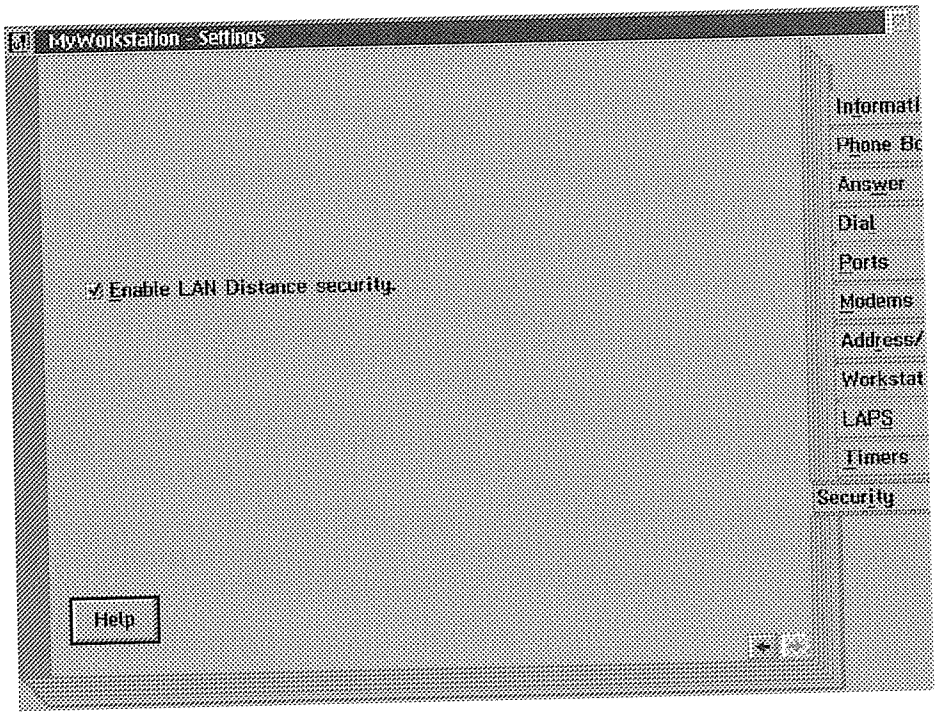


Figure 267. Properties Window (Security Section)

3. Select the **Enable LAN Distance security** radio button.
4. Close the notebook by double-clicking your mouse on the icon in the top left-hand corner.
5. You will see a message asking you if you want to save the notebook values. Select the **Yes** button.

You will receive a message telling you that some changes to the Settings notebook require you to stop and restart remote access. Other changes require you to shut down and restart your system. You can select the **Help** button to determine which configuration changes require you to simply stop and restart remote access, and which changes require you to reboot your computer. Enabling security requires you only to stop and restart the Remote Access Client.

Select the **OK** button to remove the message. Now close the Remote Access Client and restart it again. Your security options are now enabled.

5.9.5.6 Synchronizing Security on Multiple Workstations

In an environment where you have multiple OS/2 Warp 4 systems configured with security for the Remote Access Client, you may need to have identical user IDs and passphrases defined at each. You can synchronize the user accounts by copying the user account database from one computer to all of the others.

The user account database is contained in the single file named WCBUSRF.ISF, and resides in the \WAL directory. This file is opened and locked whenever you start the Remote Access Client, so you cannot copy it across a remote connection unless you make a renamed copy on your system before you start the Remote Access Client. For example:

At Computer A:

Make sure that remote access is not started.

Copy `C:\WAL\WCBUSRF.ISF` to `C:\WAL\WCBUSRF.TMP`.

Start remote access.

Establish a connection to Workstation B.

Using peer services, copy `WCBUSRF.TMP` to Workstation B.

At Workstation B:

Stop remote access.

Copy `WCBUSRF.TMP` to `C:\WAL\WCBUSRF.ISF`.

Restart remote access.

Workstation B will now have the same user IDs and passphrases defined as Workstation A.

5.9.5.7 Defining a Security Policy

A security policy determines the rules that apply to passphrases for all users. The options you can set are described in 5.9.5.3, "Security Policy" on page 491.

To set your security policy, follow these steps:

1. Select the **Policy** tab from the User Account Management notebook. The Policy page is shown in Figure 268.

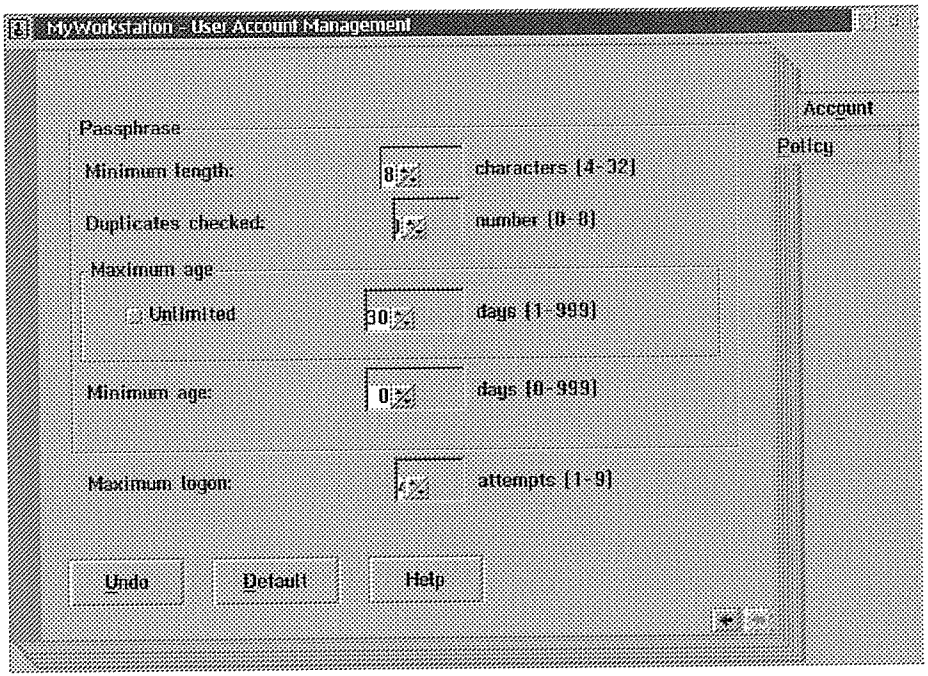


Figure 268. User Account Management Window (Policy Section)

2. Enter the values you require.
3. Close the User Account Management window by double-clicking your mouse on the icon in the top left-hand corner.

The user ID will be available immediately. You do not need to stop and restart Remote Access Client for the user ID to take effect.

5.9.5.8 Changing Your Passphrase

After you have logged on as a security administrator, you can update the account information for your own account, and also add user IDs for any other people who will use your computer.

To change user information, follow these steps:

1. Select **Selected** from the menu bar
2. Select **Open as →**
3. Select **Personal Account Information**

You will now see the Personal Account Information notebook, as shown in Figure 269.

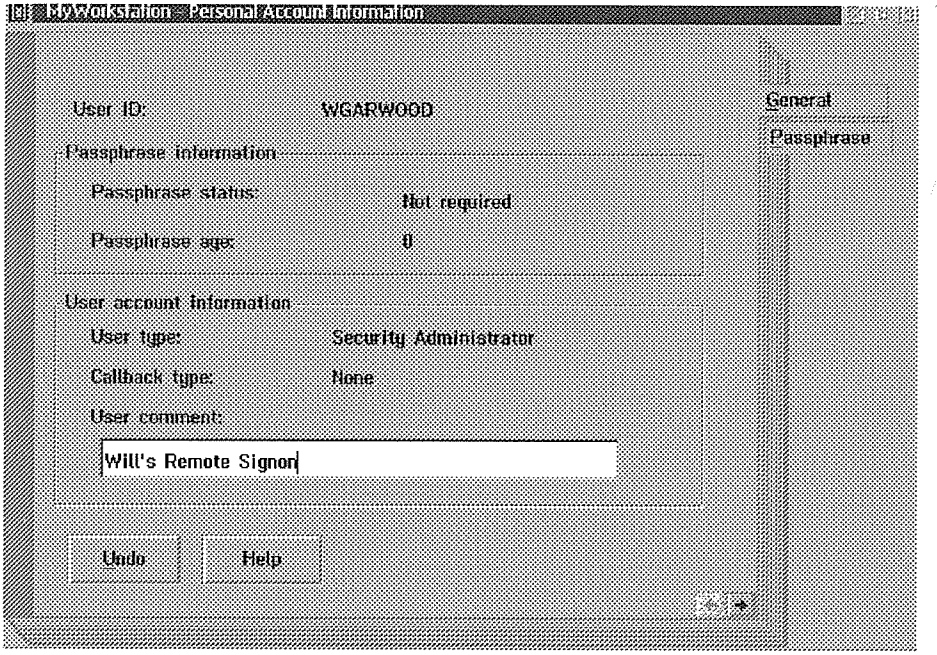


Figure 269. Personal Account Information (General Section)

This page provides information about your user account and your passphrase. The only item that you can change on this page is the User comment field.

When you select the **Passphrase** tab from the Personal Account Information notebook, the Passphrase page is displayed, as shown in Figure 270.

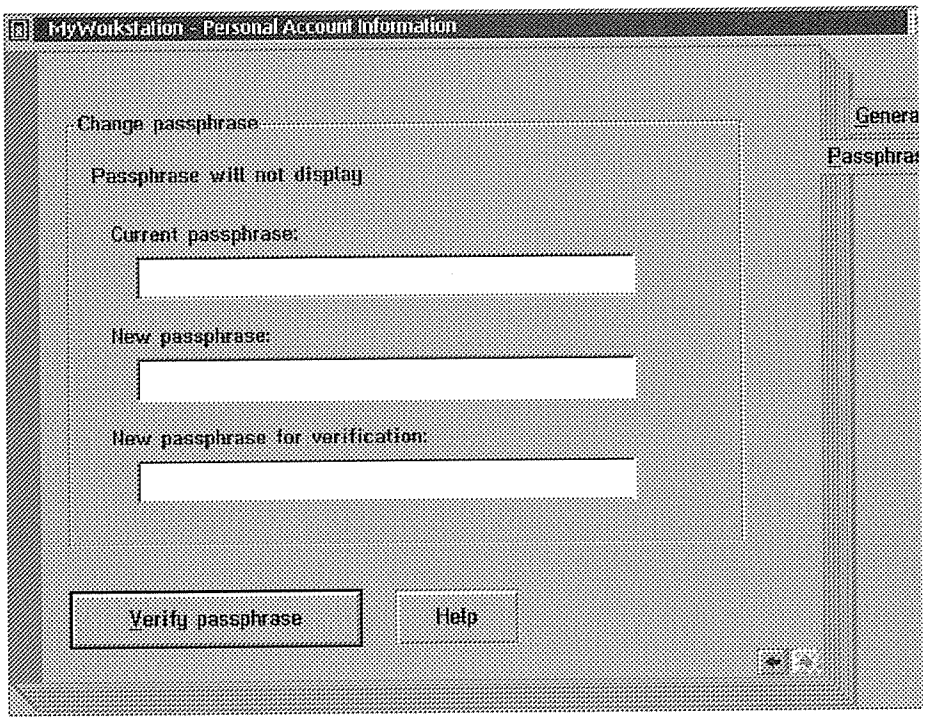


Figure 270. Personal Account Information (Passphrase Section)

This page allows you to change your passphrase. You must provide your current passphrase in order to change your passphrase. After you have typed your current passphrase and your new passphrase twice for verification, select the **Verify passphrase** button. If the verification is successful, your passphrase is then changed automatically.

5.9.5.9 Adding a New User

If more than one person will use your OS/2 Warp 4 system and requires access to the Remote Access Client, you might want to define a Remote Access Client user account for each person. To add a new user, follow these steps:

1. Select **Selected** from the menu bar
2. Select **Open as** →
3. Select **User Account Management**

The Remote Access Client then displays the **User Account Management** window, as shown in Figure 271.

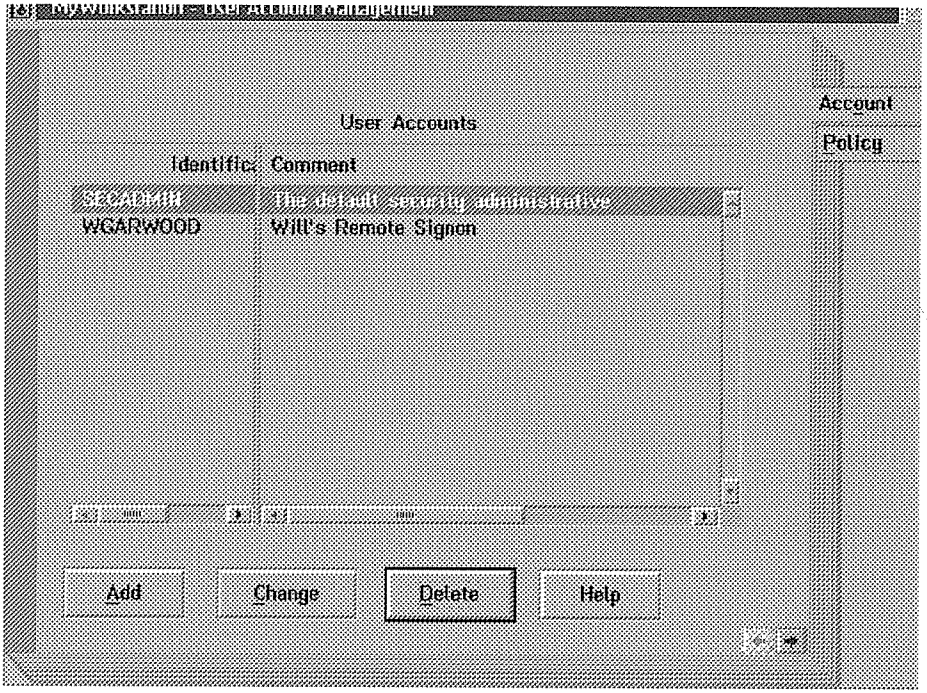


Figure 271. User Account Management Window (Account Section)

This window shows all the user IDs that are defined on your computer. To add a new user to the list, select the **Add** button from the User Account Management window.

The Remote Access Client now displays the New User Account notebook. This notebook has five pages that enable you to specify all the required information about a user account.

The first page is the Type page, as shown in Figure 272.

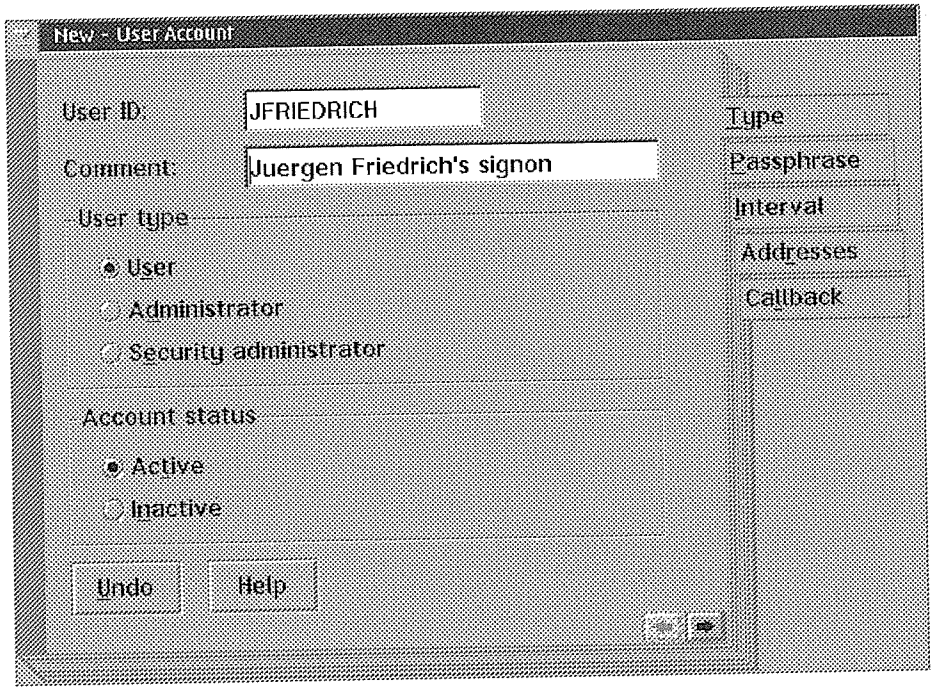


Figure 272. New User Account Window (Type Section)

On this page, enter the user ID and the type of user and the account status. See 5.9.5.2, "Types of Users" on page 490 for more information (active or inactive).

Select the **Passphrase** tab from the New User Account notebook. The Remote Access Client will then display the Passphrase page, as shown in Figure 273.

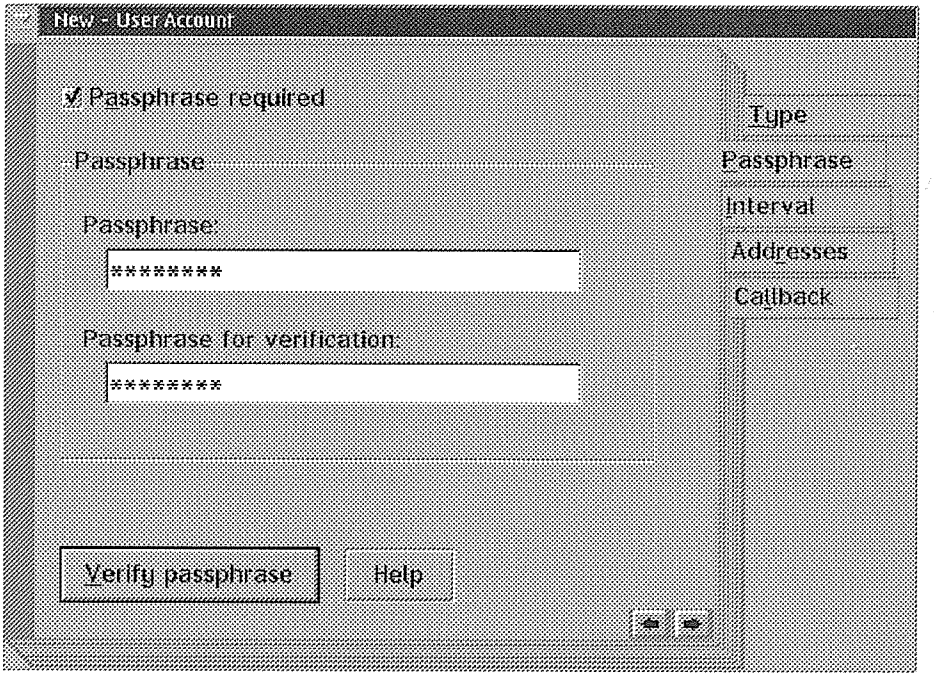


Figure 273. New User Account Window (Passphrase Section)

This page allows you to specify whether a passphrase is required for this user and if so, what that passphrase should be. Fill in the fields and select the **Verify Passphrase** button to verify your entries.

Select the **Interval** tab from the New User Account notebook to display the Interval page, as shown in Figure 274.

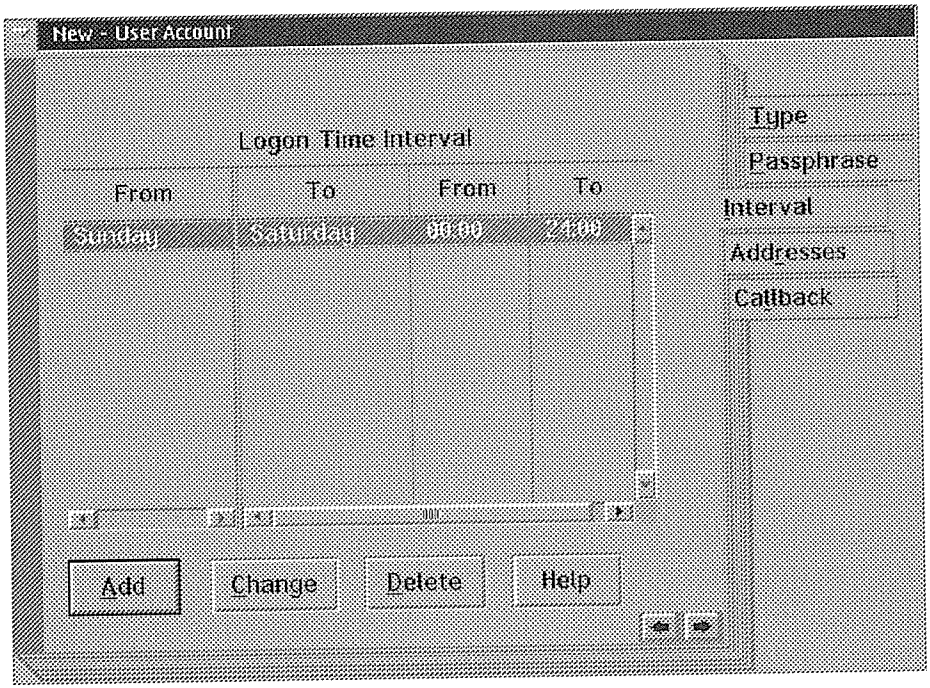


Figure 274. New User Account Window (Interval Section)

This page allows you to specify the days and times at which a user may log on and use Remote Access Client. The default interval is from Sunday at 00:00 to Saturday at 24:00, that is, no restrictions on logon.

You might want to restrict the days and times a user can log on, for security reasons or simply because you want to save on power usage. If you wish to restrict logon days and times, select the **Change** button.

Remote Access Client will display the following window:

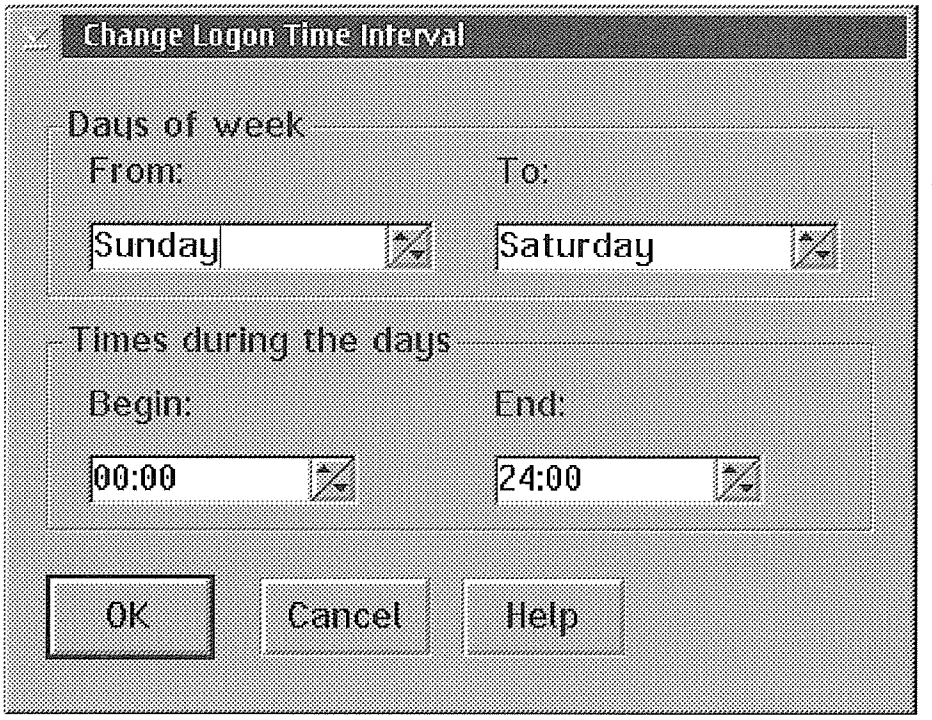


Figure 275. Change Logon Time Interval Window

Use the spin buttons to set the days and times for which you want to permit logon, then select the **OK** button to save your entries.

You can specify multiple logon intervals, by adding intervals using the **Add** button. This button will display the same window shown in Figure 275 on page 504, and you can set additional logon intervals.

Select the **Addresses** tab from the New User Account notebook to display the Addresses page, which allows you to limit the computers from which this user can log on to the Remote Access Client, as shown in Figure 276.

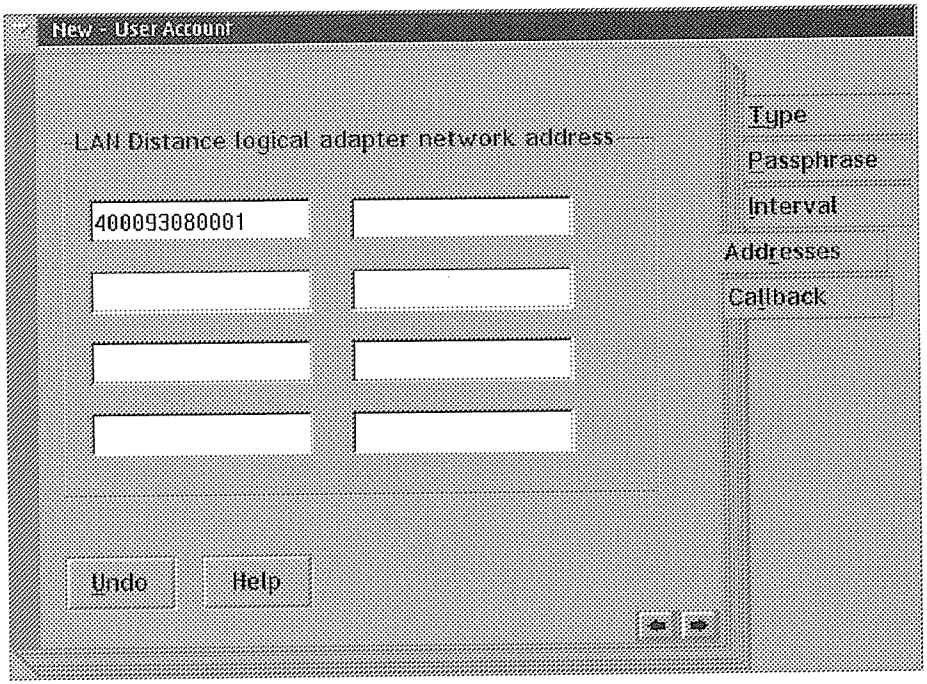


Figure 276. New User Account Window (Addresses Section)

Computers are identified on the page by their network address, also called a *logical adapter address*. It is important to note that these addresses are the ones specified in the Address/LAN Setting tabs on the connection servers/remote workstations trying to ring you. They are *not* the LAN-based addresses specified in MPTS. If you do not specify any addresses on this page, this user can use Remote Access Client from any computer

In Figure 276 on page 505, the adapter address `400093080001` is shown. This means the user can log on and use the Remote Access Client only from a computer with that adapter address. If the user needs to be able to log on from different computers, you can specify up to eight adapter addresses. Specify your adapter numbers here if your user should be able to log on from one to eight different workstations.

Select the **Callback** tab to display the Callback page of the New User Account notebook, as shown in Figure 277. This page allows you to specify callback security options for this user (see "Callback Security" on page 492 for a more detailed discussion of callback security).

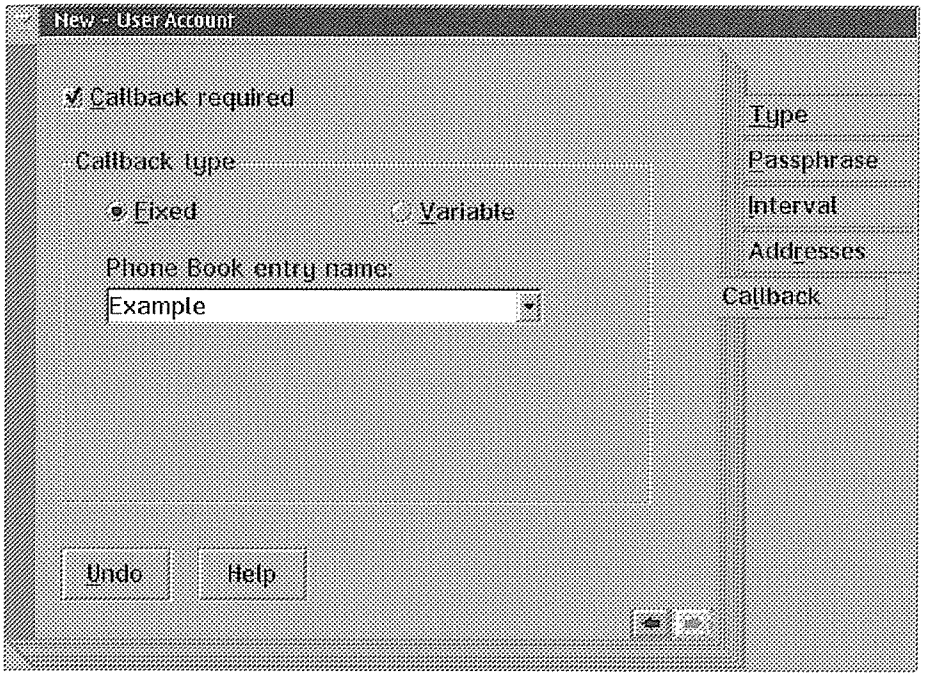


Figure 277. New User Account Window (Callback Section)

To turn on callback security, select the **Callback required** check box.

The Fixed and Variable radio buttons allow you to specify the type of callback security for this user account. If the user's location does not change, then you can select **Fixed** callback. If the user's location is subject to change, as is the case for a traveling employee dialing in from customers' offices or hotels, then you should select **Variable** callback.

Select an item in the PhoneBook entry name dropdown list to specify the number that the server should dial for callback. Note that the PhoneBook entry must have the same name as the user account you are creating. If you specify **Fixed** callback, the PhoneBook entry must include a telephone number. However, if you specify **Variable** callback, the entry need not include a telephone number, since the Remote Access Client will ask for the number when dialing.

Close the New User Account window by double-clicking your mouse on the icon in the top left-hand corner. You have now created the new user account.

5.9.6 Further Configuration through the Settings Notebook

In most cases, the Remote Access Client will be configured during installation. However, you can change the installation's configuration using Settings.

Note: Configuration of a Remote Access Client at installation of OS/2 Warp 4 is recommended as this is easier.

In this section, you will learn how to configure (or reconfigure):

- The COM or WAN port
- The modem
- The logical LAN Distance address
- The answer mode
- The workstation
- The PhoneBook
- LAPS

We will also discuss how to save the configuration and restart the workstation.

5.9.6.1 Open the Remote Access Client Settings Notebook

After you install OS/2 Warp 4, click on **Connections => Network => Network Services.** to start the Remote Access Client. You will probably be in LAN mode. You will need to select **Remote** and reboot the machine in order to configure or reconfigure Remote Access Client. Make sure you understand the difference between LAN and remote shuttle modes. Please see 5.9.3, "Understanding the LAN Distance Shuttle Option: Remote versus LAN" on page 485.

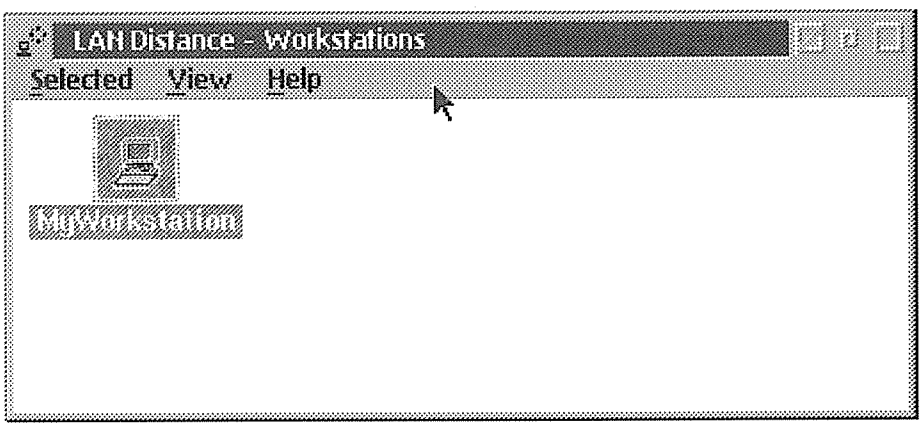


Figure 278. Workstations Window

Figure 278 on page 507 shows you the LAN Distance - Workstations window after you have started the Remote Access Client program. Notice that there is one icon in this window that looks like a PC and is labeled **MyWorkstation**. This icon represents the workstation you have just installed Remote Access Client on.

To open the Settings notebook for your workstation, follow these instructions:

1. Select the icon representing your workstation, with the right mouse button (see Figure 279 on page 508), or select the icon representing you workstation, with the left mouse button and select **Selected** from the menu bar.

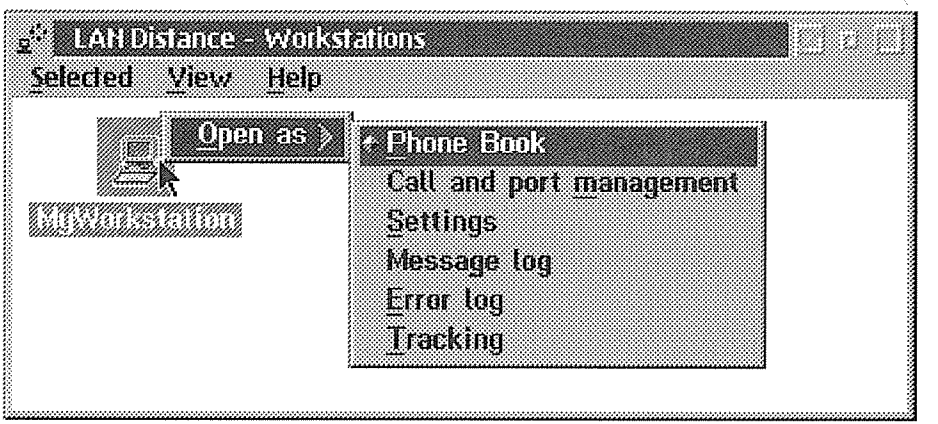


Figure 279. Open Notebook

2. Select **Open as ->**.
3. Select **Settings**.

The Remote Access Client Settings notebook is displayed, as shown in Figure 280.

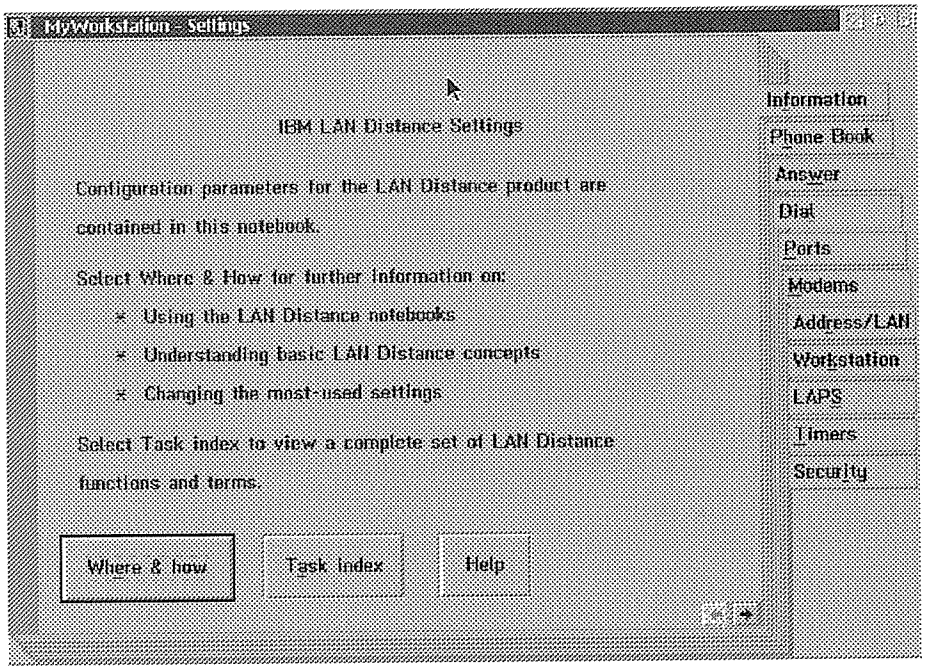


Figure 280. Settings Window

Maximize the window, or use the page right arrow on the bottom to see the "Security" notebook tab.

5.9.6.2 Configure the COM Port

The COM or WAN port is the part that Remote Access Client uses to communicate with a LAN Distance Connection Server, Warp Server Connection Server or other remote workstations in the WAN. It is the access point for connections to and from your workstation. Calls are dialed and answered through these ports. Generally speaking, one port is required for every modem on your workstation.

Configure one Remote Access Client port for every modem on your workstation. The following types of ports are defined for the Remote Access Client product:

- Asynchronous and synchronous ports for ARTIC adapters with external modems
- Asynchronous COM ports with internal or external modems
- ISDN ports (set up using the ISDN support program)
- ISDN Waverunner modem

A number of Remote Access Client ports can be configured depending on your hardware configuration, your WAN environment, and your requirements. In this case, we configure only one WAN port to use with an asynchronous modem.

Follow these steps to configure the WAN port:

1. From the LAN Distance Settings notebook, select the **Ports** tab.

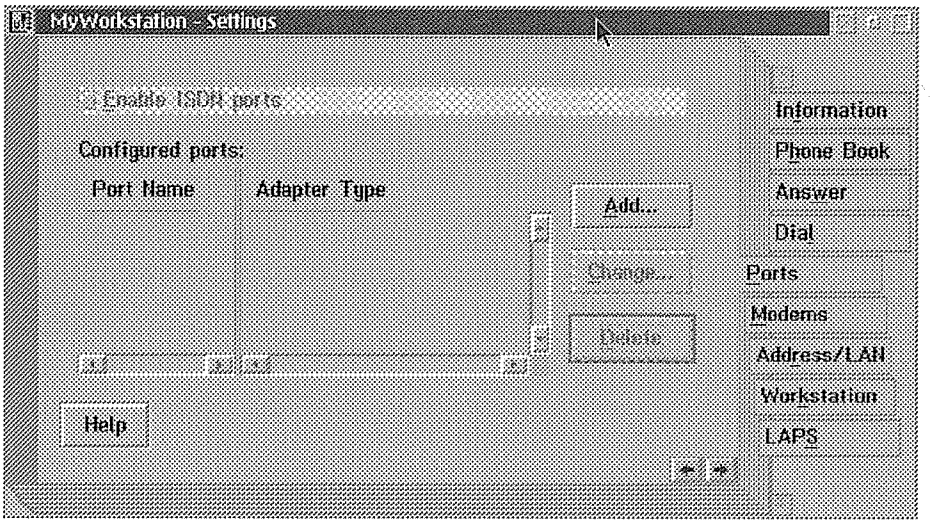


Figure 281. Settings Window - Add Port

2. From the notebook page, as shown in Figure 281 on page 510, select the **Add...** button.

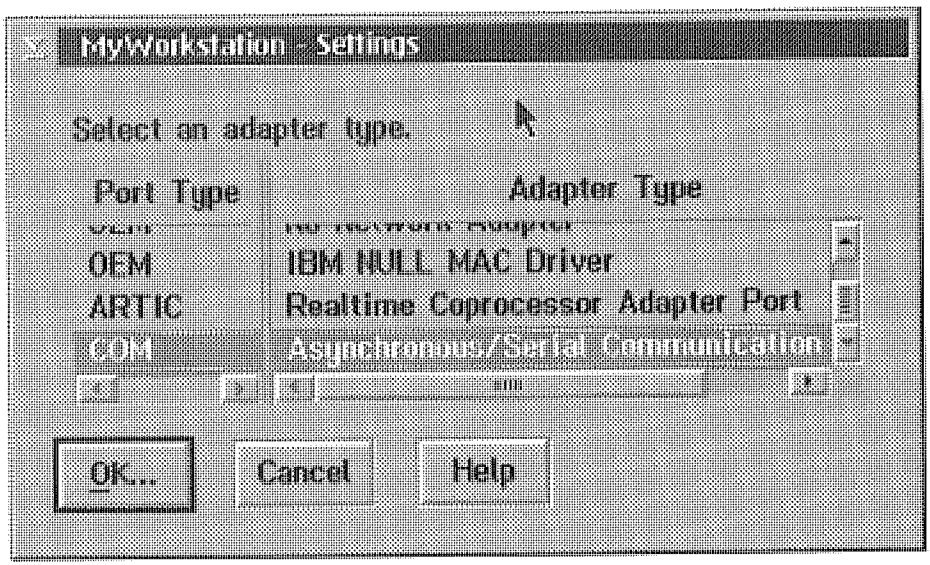


Figure 282. Settings Window - Select Port Type

3. Select the port type you are using.

   In this case we are using an asynchronous modem via a COM port.

4. Select the **COM Asynchronous/Serial Communication** line from the list box.

5. Select the **OK** button.

   The COM Port - Settings window (Figure 283) will be displayed.

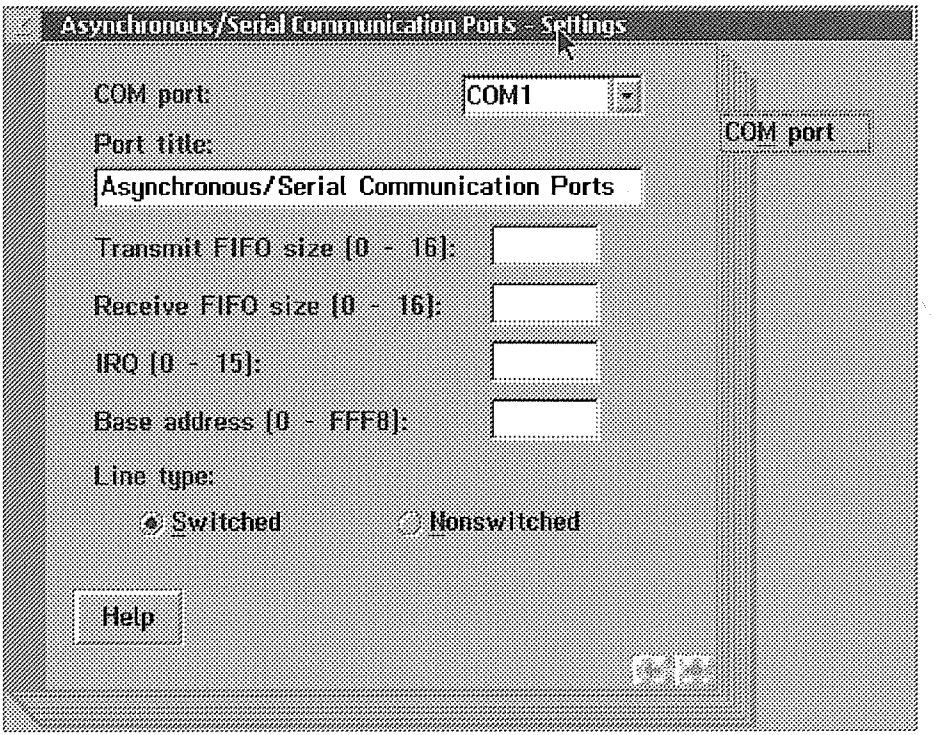


Figure 283. COM Port - Settings Window

6. All defaults can be accepted.

   The fields presented in the COM Port - Settings window do not generally need to be changed. In most cases, Remote Access Client queries the COM port hardware in your workstation and uses it effectively. If you enter values into any of these fields, you must be certain they are accurate. Otherwise, Remote Access Client may not function correctly.

COM or Serial Ports on Your Workstation

If you cannot identify your COM or serial ports on your PC, refer to your workstation's manual. Most PCs have two COM ports (COM1 and COM2) although they may also be referred to as COM A and COM B (COM1 and COM2 respectively). OS/2 Warp 4 has by default COM1 and COM2 configured. If your machine has *physically* COM1, COM2, COM3 and COM4, you will need to configure OS/2 Warp 4 to see COM3 and COM4. To configure them, edit the DEVICE=C:\OS2\BOOT\COM.SYS line in the CONFIG.SYS as follows:

```
DEVICE=C:\OS2\BOOT\COM.SYS (3,3E8,5) (4,2E8,9)
```

The parameters following indicates the COM port (3 or 4), I/O address (3E8 or 2E8) and the IRQ (5 or 9).

For further information on this, type `HELP COM.SYS` in an OS/2 window. It is recommended that the COM port on your machine have *buffering* for better performance. COM ports will need to have a UART chip of 16550 or better. Type `MODE COM1` in an OS/2 window to see if COM1 has buffering. BUFFER=ON means you have buffering. BUFFER=N/A means you don't. This command works for the other COM ports as well.

Because we are using an asynchronous modem, we can accept the default line type of Switched. If your workstation and connection server are connected via a leased line, or directly connected via their asynchronous COM ports, then Nonswitched would be selected (for example, if you are using a null modem cable).

7. Close the COM Port - Settings window.

   Select the system icon at the top-left corner of the notebook, and then select **Close**.

5.9.6.3 Configure the Modem

If you are using a modem to connect into the WAN, then it must be configured and attached to a COM port. What you are actually configuring here is the *initialization* file or PIF (Product Information File). This file prepares the modem for communication. It is very important that you select the right option here. The most common mistake made with Remote Access Client configuration is selection of the wrong PIF file. We will discuss later in this section what to do if your modem is not listed.

Follow these steps to configure a modem:

1. Select the **Modems** tab from the Settings notebook.

   The following window is displayed:

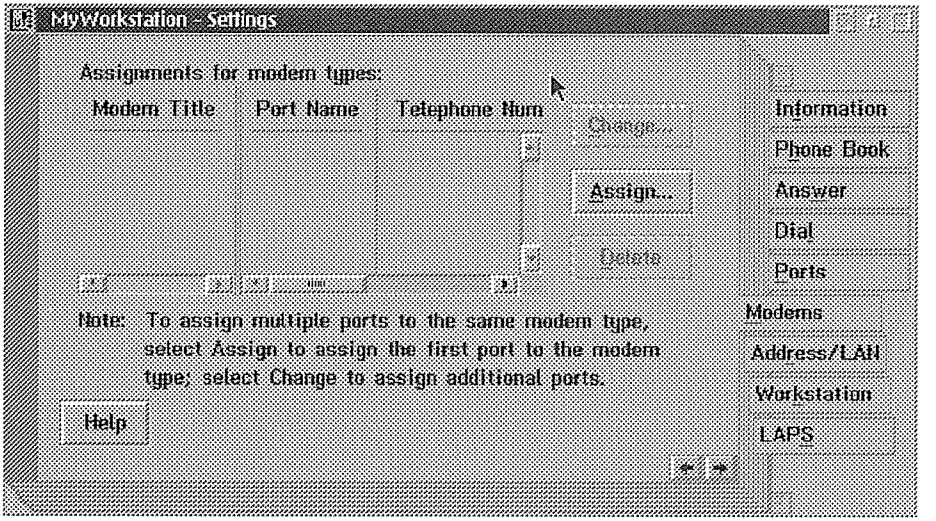


Figure 284. Settings Window - Assign Modems

2. Select the **Assign...** button.

   A list of modems is displayed.

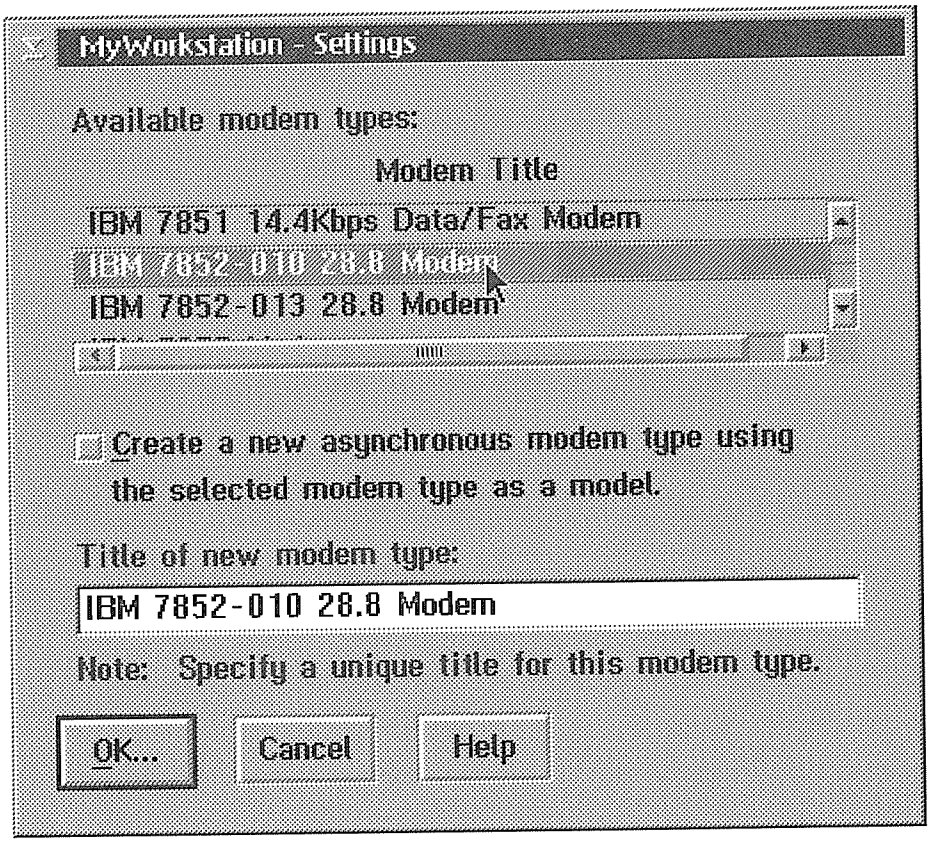


Figure 285. Settings Window - Select Modem

3. Select a modem from the **Available modem types** list box.

   In our environment, we are using an IBM 7852-010 28.8 V.34 modem.

   Note: If your modem is not listed in the Available modem types list box, have a look at your modem's manual to see if it's compatible with one that is listed. For instance, Hayes-compatible modems are very popular.

   An unlisted modem that is not compatible with any listed modem can be configured with the CFMODEM utility included in Remote Access Client by:

   - Creating a new asynchronous modem type using an existing modem as a model.

     Using this method, you must select a modem that is similar in operation and function to your modem. The existing modem definition is copied, creating a

new entry in the list. Now you modify the modem setup with the help of your modem user's guide.

- Creating a PIF file for your unlisted modem using the PIF file of a listed modem as a template.

  See the online help or *IBM LAN Distance Version 1.1 Configuration and Customization Guide*, GG24-4158, for a better understanding of modem PIF files and use of the CFMODEM utility.

  To access CFMODEM, type `CFMODEM` in an OS/2 window.

Modems

Both internal and external modems can be used with the Remote Access Client. An internal modem and an external modems are basically the same except that internal modems are fitted into a slot (for example, ISA or PCI slot) *inside* your workstation. If you already have two COM ports on your PC, you will probably need to configure the internal modem as COM3 (see the modem's instructions). This requires an extra interrupt. I/O port and the OS/2 COM.SYS driver will need to be modified to configure COM3. Make sure you follow installation instructions that came with the modem. External modems are more popular and are a lot easier to configure. They plug into one of the COM ports on the *outside* of the PC.

If you plan to make extensive use of the Remote Access Client, it is important to consider the maximum speed of your modems.

A modem speed of 14,400 or 28,800 bps is sufficient for small to medium amounts of traffic, such as interactive host access. You can also use this type of connection for medium-density traffic such as Lotus Notes or DB2/2, or for accessing the World Wide Web.

However, if you try to use such connections for transferring large amounts of data, or for loading large applications remotely from a server system, the performance of your dial-up connection is unlikely to be sufficient. If you need to work with large data files or applications from home or while travelling, you should consider using an ISDN connection. The greater transmission speeds available will allow you to work satisfactorily with larger amounts of data, and provide you with a better entry point to the future of network-centric computing.

4. Select the **OK...** button.

   The following IBM 7852-010 28.8 Modem - Settings notebook is displayed.

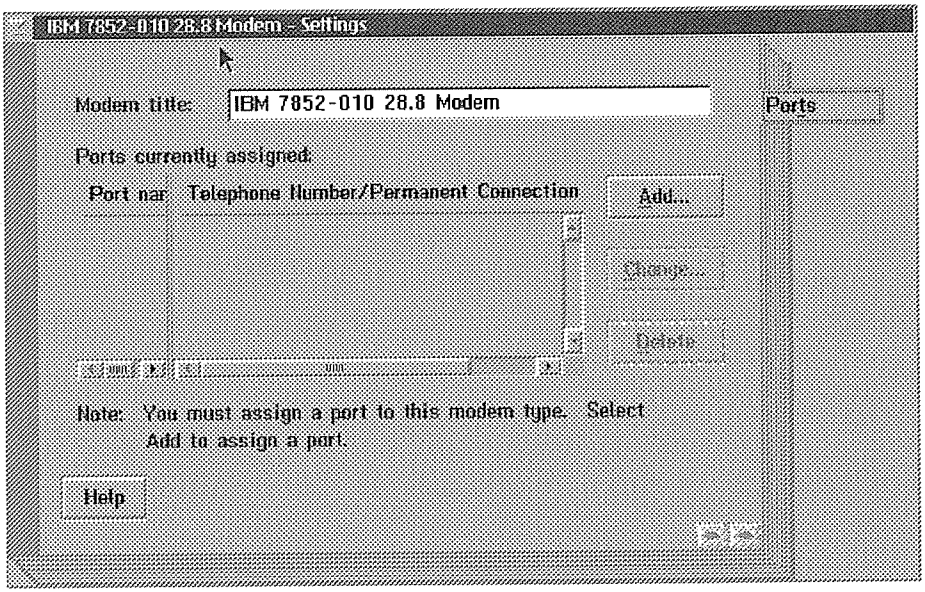


Figure 286. IBM 7852-010 28.8 Modem - Settings Window (Add Modem)

5. Select the **Add...** button.

   You are presented with a window that allows you to enter either a phone number or a permanent connection name. These two fields are comment fields that become part of the phone book/answer mode entries and are used to help select a specific port to make a connection on. (If you enter nothing here, then Unspecified is generated for those entries.) We recommend that you fill in these fields. Then later, in the call and port management, there will be information that represents your system environment and makes it easier to manage your ports.

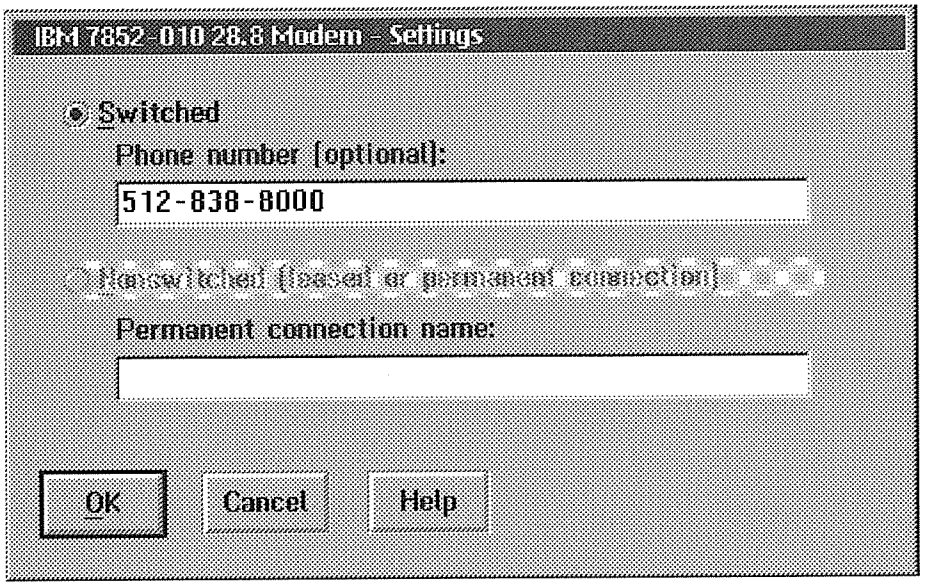


Figure 287. IBM 7852-010 28.8 Modem - Settings Window (Phone Number)

6. (Optional) Enter the phone number to be dialed by a remote workstation or connection server to connect to your workstation via this modem and port.

   The phone number identifies the specific modem and port that remote workstations and connection servers dial to communicate with this workstation. This will be displayed later in the call and port management, allowing you to see which line is in use.

   Note: As mentioned, this is optional and in most cases, you will NOT have remote workstations and connection servers dialing you. Be sure to distinguish this setup from the PhoneBook setup that sets up telephone numbers of the connection servers and remote workstations that your workstation will be dialing (this is discussed in 5.9.6.7, "Configure the PhoneBook" on page 526).

7. Select the **OK** button.

   You must now select the port to which this modem is attached. In this window, you see ports that previously have been added, but which have not been assigned to a modem type.

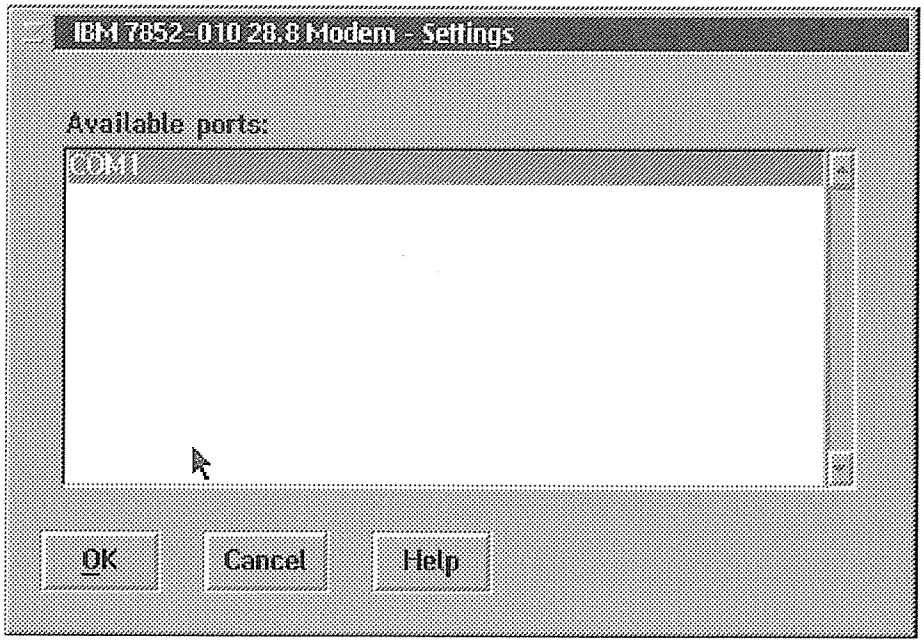


Figure 288. IBM 7852-010 28.8 Modem - Settings Window (Settings OK)

8. Select **COM1**.
9. Select the **OK** button.

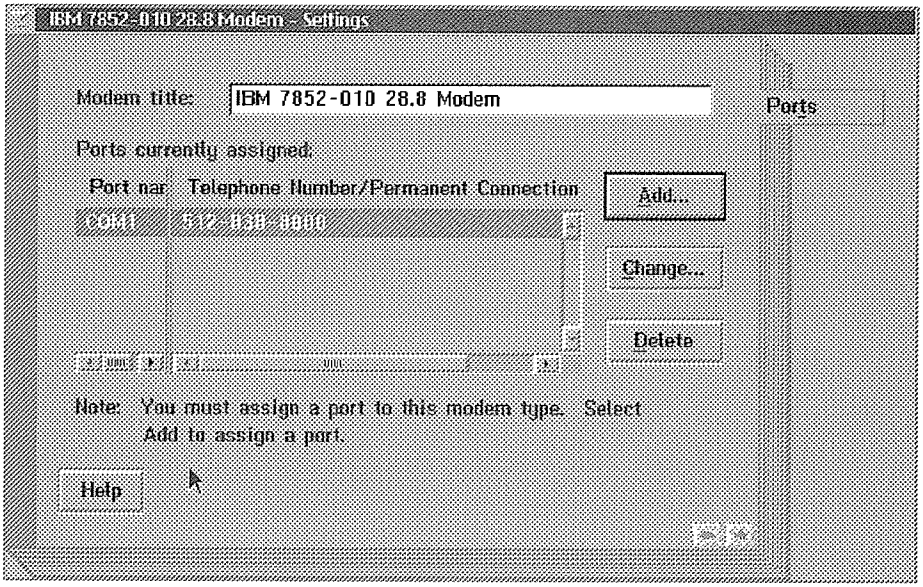


Figure 289. IBM 7852-010 28.8 Modem - Modem - Settings Window (Assign Mode to a Port)

Figure 289 on page 520 shows you the modem type and the port it is assigned to. The phone number is the number a remote workstation or connection server must dial to connect to this workstation. If the same modem type was connected to COM1, COM2, and COM3, then each port would be shown along with the phone numbers to dial.

10. Close the window to finish the modem configuration.

    Note: The assignment of a port to a modem type provides the association between your logical ports and your physical WAN hardware. One modem type can have multiple ports assigned to it as long as there is physically one modem attached to your system for each port defined.

5.9.6.4 Configure the Network Address and LAN Frame Type

The following shows you how to configure the Address/LAN tab.

1. Select the notebook tab **Address/LAN** from the **Settings** notebook.

   The following window is displayed:

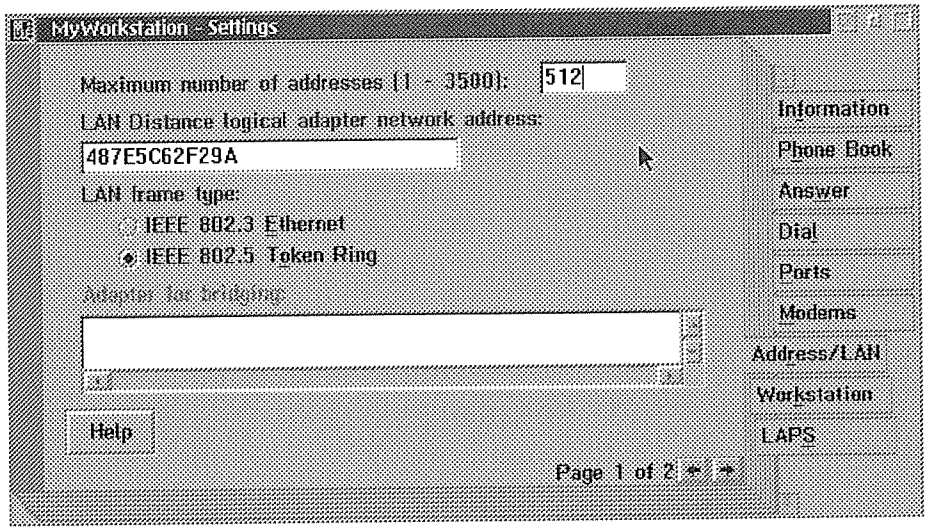


Figure 290. Settings Window (Address Section: Page 1 of 2)

2. Enter the LAN Distance logical adapter network address.

   LAN Distance will automatically generate an address that you can use. This address should be unique within the LAN/WAN network. If you are setting up a large LAN/WAN environment, then these addresses should be managed centrally and should be based on a standard convention.

   The workstation is assigned a logical adapter network address so that it can be uniquely identified on a LAN Distance wide area network. During installation of Remote Access Client, you can either specify a logical adapter network address or allow one to be automatically generated. It is not guaranteed that the logical adapter network addresses generated by Remote Access Client are unique. After installation, verify that your logical adapter network address is unique across all segments of your LAN Distance wide area network as well as your normal physical LAN.

   To do this, you can use the OS2PING utility. Here's an example of OS2PING in action where it has found the same adapter address on the network. In this case, a new address will have to be used. Talk to your network administrator about getting another address if this problem arises.

   The 08005AA72AB5 is the logical adapter network address:

```
[C:\]os2ping a=08005AA72AB5
                (C) IBM Corporation 1990,1993

OS2PING  Version 0.061 - 11/11/93
```

```
OS2PING: First response received
OS2PING: 1 response received during 10 second wait
```

OS2PING can be used for testing normal network adapter addresses as well. It is a very good tool for verifying that your workstation is on the network. For example, you can OS2PING another adapter address on another machine on the network. If you get an answer, then your machine is on the network.

3. Leave the other values at their defaults. See the online help for further descriptions.

   Note: On page 2 of 2 you are asked about the optional LAN Distance logical network adapter address. This optional LAN Distance logical network adapter address is required only if more than five NDIS protocols are used on your workstation.

5.9.6.5 Configure the Answer Modes

Answer mode is necessary when you wish connection servers and remote clients to call and connect to your workstation *or* when you have set up callback on a LAN Distance Connection Server and Warp Server Connection Server.

Callback allows a LAN Distance Connection Server and Warp Server Connection Server to call your workstation rather than you calling the server. Basically, the remote workstation initially dials the server and the server then dials the remote workstation back. The remote workstation will respond only if answer mode is started.

Follow these steps to set up the answer mode for the Remote Access Client.

1. Select the **Answer** tab.

   This displays the answer configuration page of the Settings notebook.

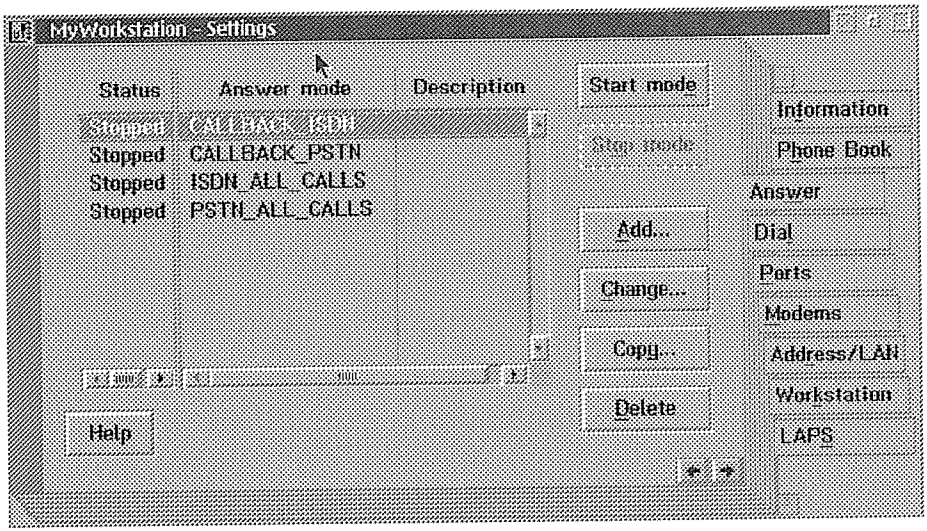


Figure 291. Settings Window (Answer Section: Change Settings)

2. Select **Stopped PSTN_ALL_CALLS**.

   Four answer modes are installed, but not initially activated, on your workstation. All enable your workstation to accept all incoming calls for a particular connectivity. The preconfigured answer modes are:

   CALLBACK_ISDN Enables Callback facility for ISDN

   CALLBACK_PSTN Enables Callback facility for Public Switched Telephone Networks

   ISDN_ALL_CALLS Enables normal answer mode for ISDN

   PSTN_ALL_CALLS Enables normal answer mode for Public Switched Telephone Networks

   Select the **Change...** button.

   This presents another notebook that allows you to set up the answer criteria for the PSTN_ALL_CALLS answer mode.

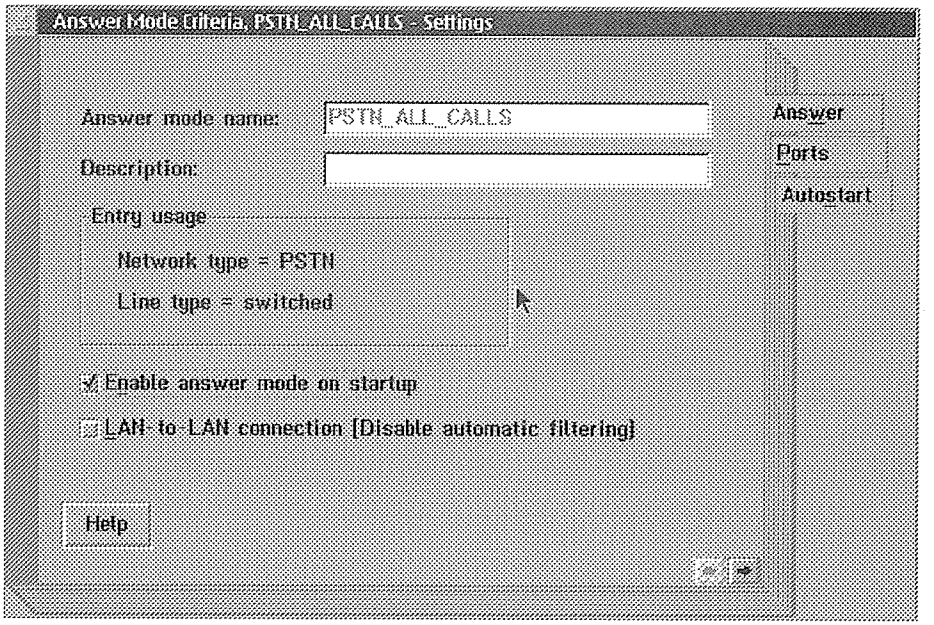


Figure 292. Answer Criteria - Settings Window (Enable Answer)

3. Check the **Enable answer mode on startup** check box.

   This sets up Remote Access Client to automatically activate this answer mode every time Remote Access Client is started.

   Note: The Ports and Autostart notebook tabs are optional. The Ports tab is available if your workstation is configured to use a modem (PSTN) and a typical telephone line (switched). You can select the **Ports** tab to specify whether to enable all ports or specific ports to answer calls. You can select the **Autostart** tab if you would like to automatically start a program when the connection is established.

   Close the Answer Criteria notebook by selecting the system icon at the top-left corner of the notebook, and then select **Close**.

   You are returned to the LAN Distance Settings Notebook.

5.9.6.6 Configure the Workstation

This enables the name and description of the Remote Access Client to be defined. Initially, after Remote Access Client has been installed, the workstation name is MyWorkstation. This name should be changed to something more meaningful, since all Remote Access Client/LAN Distance workstations on the LAN can be seen from the LAN Distance - Workstations window. To change the workstation configuration, follow these steps:

1. Select the **Workstation** tab from the Settings notebook.
2. Enter the local LAN Distance workstation name.
3. Enter the local LAN Distance workstation description.

   All other options can be left as the default. The window looks similar to the following:

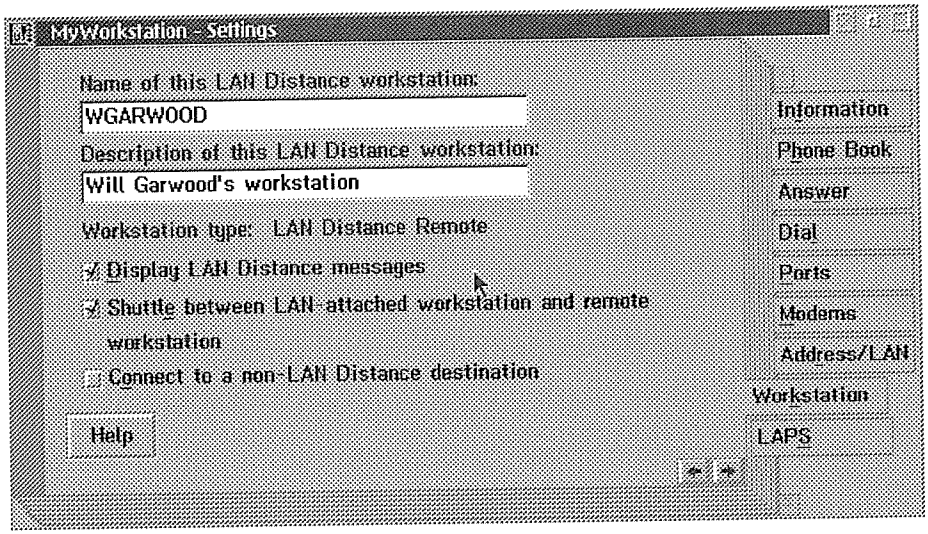


Figure 293. Settings Window (Workstation Section)

Note: Select the **Display LAN Distance messages**. check box to display a notification whenever a LAN Distance message is generated. If you select this check box, a message notification pop-up window is displayed for each error message posted in your LAN Distance system.

If you do not require messages to be displayed for a LAN Distance system, deselect the **Display LAN Distance messages** check box.

Select the **Shuttling between LAN-attached workstation and remote workstation** check box to enable the workstation to be moved from a remote environment and a LAN-attached environment and vice versa.

Select the **Connect to a non-LAN Distance destination**. check box to access non-LAN Distance workstations. Use this feature if you are not using security in your LAN Distance environment. You can set all LAN Distance Remote workstations and LAN Distance Connection Servers to connect to a non-LAN Distance destination, and the system performance will be increased.

Note

All Remote Access Client/LAN Distance remote workstations and Connection Servers must match in this option. That is, either all are set up to connect to a non-LAN Distance destination (this box is checked) or all are not set up to connect to a non-LAN Distance destination (this box is not checked).

5.9.6.7 Configure the PhoneBook

In this section, the phone numbers of LAN Distance/Warp Server connection servers and remote workstations that your remote workstation will dial up are configured.

Follow these steps to configure a new telephone number:

1. From the Settings notebook (this notebook should no longer be named MyWorkstation if you configured it to have a unique name), select the **PhoneBook** tab.

   The following window is displayed:

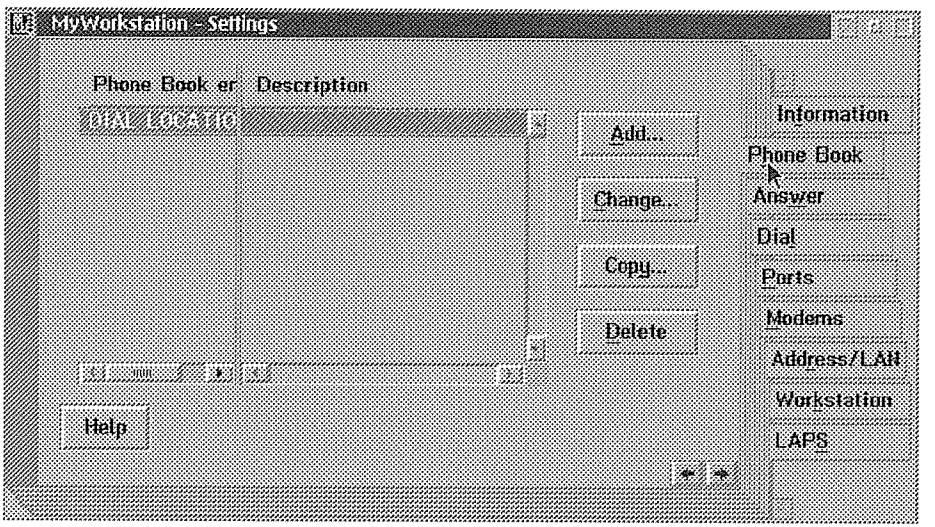


Figure 294. Settings Window (PhoneBook Section)

   Note: The PhoneBook entry/Description lists the entries in your phone book, along with their descriptions.

   PhoneBook entries provide all the configuration information that your workstation and its hardware require to call a connection server or another remote workstation.

2. As shown in Figure 294 on page 526, select the **Add...** button.

In the following window, you have to specify the type of telephone lines and modems you use to call connection servers and remote workstations.

This window is displayed every time you add a PhoneBook entry. If your workstation is configured for both network and line types, then the window displays every time you configure a PhoneBook entry.

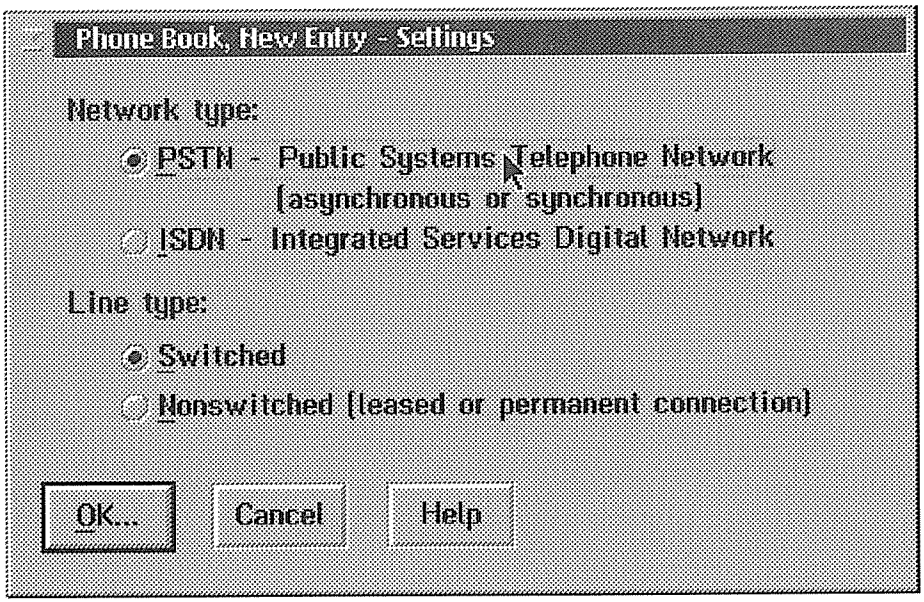


Figure 295. PhoneBook, New Entry - Settings Window

3. In the Network type section, select **PSTN**.

   PSTN is used to configure a PhoneBook entry for a workstation you call with a synchronous or asynchronous modem over typical telephone lines. If your workstation has only a modem (and no ISDN adapter), PSTN is automatically selected for you.

   Note: ISDN is used to configure a PhoneBook entry for a workstation you call on an ISDN network. ISDN stands for Integrated Services Digital Network and supports end-to-end digital voice and data services.

   If your workstation has only an ISDN adapter (and no modem), ISDN is automatically selected for you.

4. In the Line type section, select **Switched**.

   Switched is used if you want to call the PhoneBook entry workstation over a regular telephone line. If you selected **PSTN** on the Network type field, Switched is defaulted for you.

Note: Non-switched is used if you want to call the PhoneBook entry workstation over a leased line or through a permanent connection (for example, connect two workstations with a null modem cable).

5. Select the **OK...** button.

   The following window is displayed:

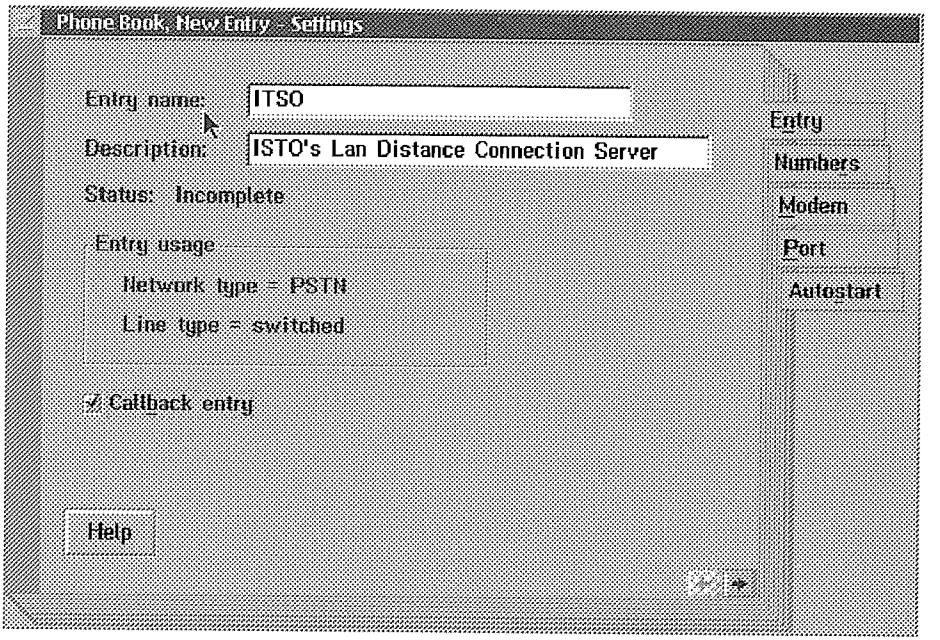


Figure 296. PhoneBook, New Entry - Setting Window (Entry Section)

Here you can add or change the PhoneBook entry name, the description and usage. This window also displays the status of the configuration.

6. Enter the Entry name.

   The Entry name field is used to specify the name of the server/workstation you dial. The entry name must be a unique entry in the PhoneBook.

   The field length is 15 characters.

7. Enter the Description.

   The Description field is used to specify a description or notes about the server/workstation you dial.

8. Check the **Callback entry** check box only if you want to use the callback facility (for example, when a callback-enabled remote workstation rings you, your workstation will ring them back with this number).

Note: The Entry usage area displays the type of network and line type you've configured for this PhoneBook entry.

9. Select the **Numbers** tab.

   The following window is displayed, and you can see a Telephone number list box. The workstations you call might have more than one telephone number. Use this list to view the telephone numbers of the PhoneBook entry and the order in which they are dialed. The top most numbers will be dialed first.

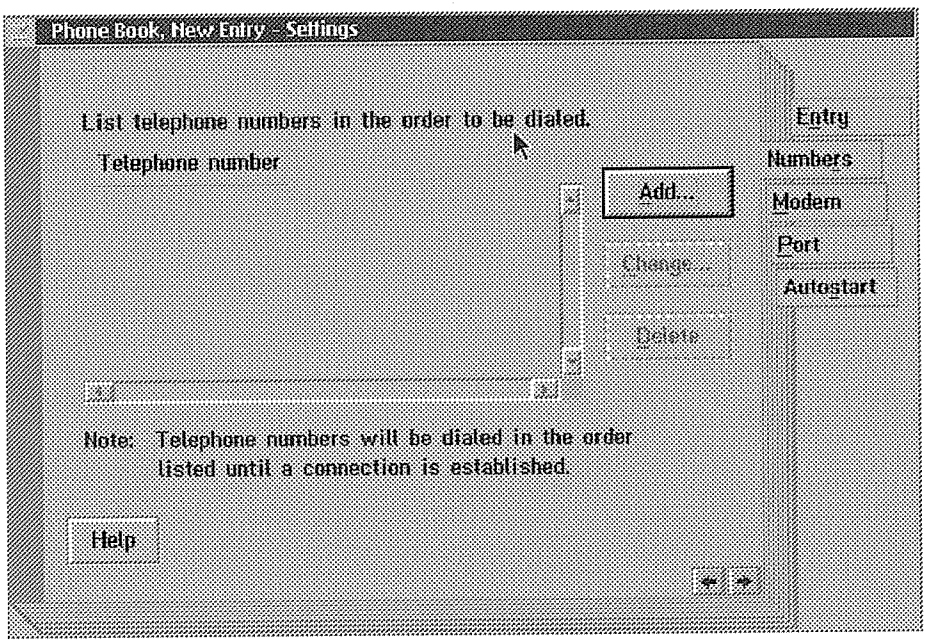


Figure 297. PhoneBook, New Entry - Settings Window (Numbers Section 1/3)

10. Select the **Add...** button.

    The PhoneBook, New Entry - Settings window is displayed:

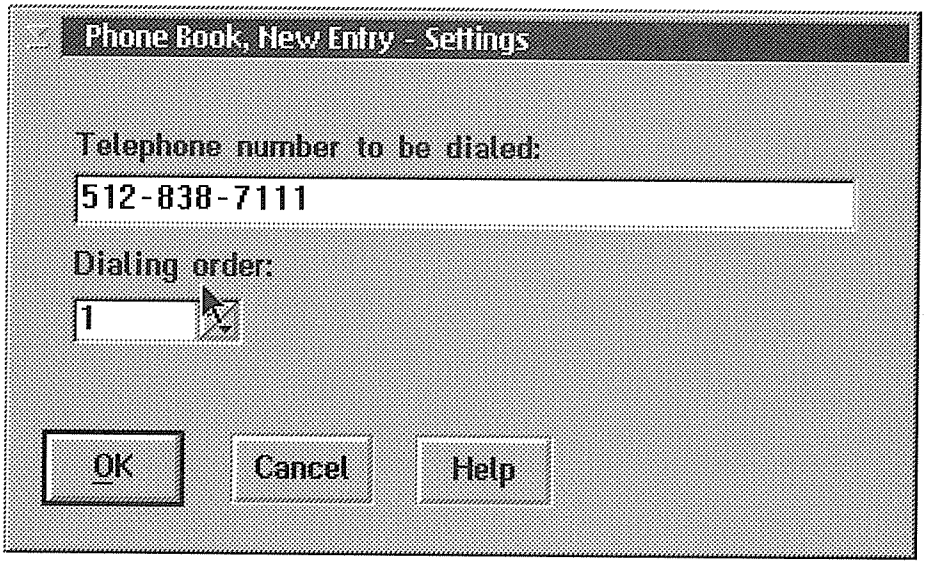


Figure 298. PhoneBook, New Entry - Settings Window (Numbers Section 2/3)

This window is displayed when you configure a PhoneBook entry or a telephone number for a PhoneBook entry.

11. In the Telephone number to be dialed field, enter the phone number of the workstation you want to call. The field length is 32 characters.

    Note: The Dialing order field specifies the position of the telephone number in the PhoneBook entry call order list. The telephone numbers in the list are called from top to bottom. The top numbers are called first.

12. Select the **OK** button, which shows you the result. You can see that you now have one phone number for that PhoneBook entry, as shown here:

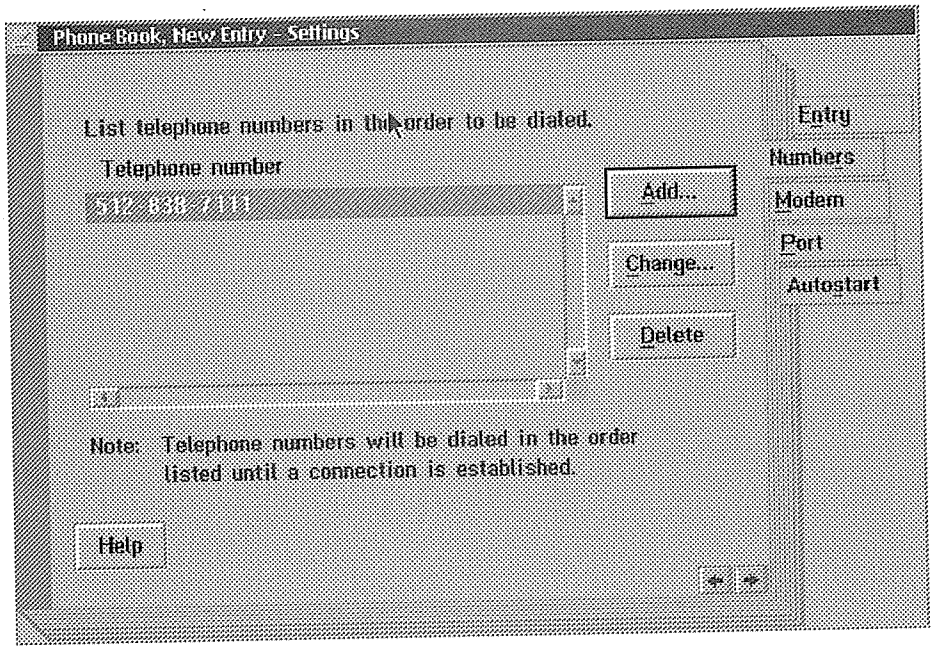


Figure 299. PhoneBook, New Entry - Settings Window (Numbers Section 3/3)

Note: Use this list to add, change or delete telephone numbers. Use the appropriate push button to modify the telephone numbers, or the order in which they are dialed.

13. Select the **Modem** tab.

    The window that is presented describes the modem capabilities of the workstation you are calling.

    A modem is either asynchronous or synchronous. If it is asynchronous, specify the class of the modem. If a modem is synchronous, specify the encoding scheme used to synchronize the transmittal of data.

    Based on the modem capabilities of the workstation you call, the Remote Access Client software selects the correct modem on your workstation for the call.

    If the workstation you call has an asynchronous modem, an asynchronous modem is selected for your workstation that best matches the modem class of the modem on the workstation you call.

    If the workstation you call has a synchronous modem, a synchronous modem is selected for your workstation.

    If your workstation does not have an appropriate modem available, then the call will fail and a message will be displayed.

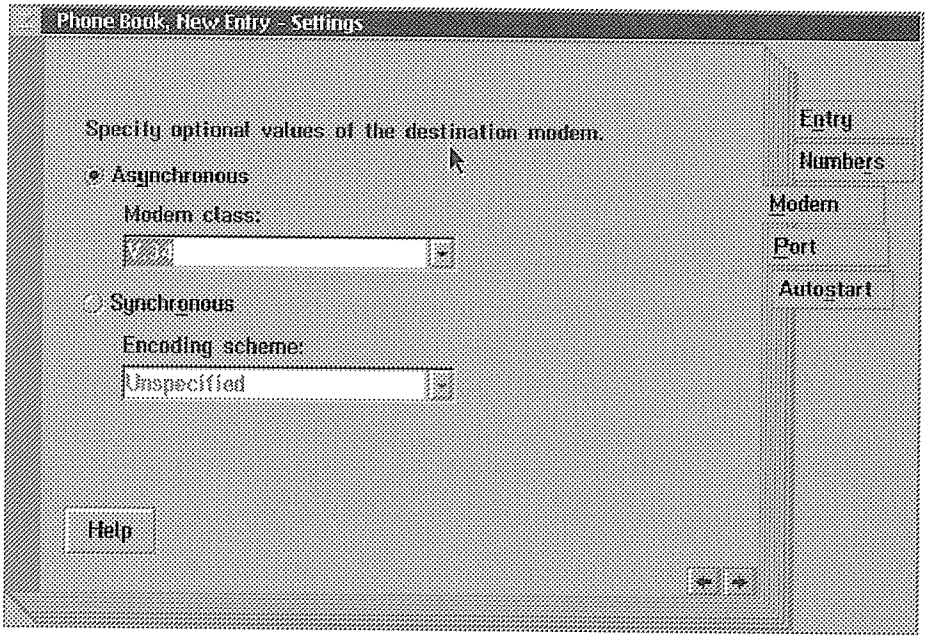


Figure 300. PhoneBook, New Entry - Settings Window (Modem Section)

This tab describes the modem capabilities of the workstation you are calling.

14. Select **Asynchronous**.

    Asynchronous is used if your external or internal modem uses the asynchronous data transmission mode.

15. Select the Modem class. This represents the fastest modulation standard supported by the asynchronous modem.

    Selecting a modem class is necessary only when you have multiple modems installed. If you have only one modem installed, the Remote Access Client software uses the fastest modem class that is appropriate for your modem. Select a modem class for the workstation you are calling. The choices are:

    - Unspecified
    - V.22 at 1200 bps
    - V.22bis at 2400 bps
    - V.32 at 9600 bps
    - V.32bis at 14400 bps
    - V.34 at 28800 bps

- Proprietary

Note: The LAN Distance software selects one of your modems that best matches the modem of the workstation you are calling.

Synchronous is used if your external or internal modem uses the synchronous data transmission mode. Consult your modem manual to select an encoding scheme for your synchronous modem. This parameter needs to be defined only for synchronous modems.

The Encoding scheme parameter specifies the encoding scheme to be used when transmitting data for this call. The encoding schemes are:

- NRZ (non-return-to-zero)
- NRZI (non-return-to-zero inverted)

16. Select the **Port** tab.

    The following window is displayed. You use this tab if you have multiple ports and want to assign a specific port to a PhoneBook entry.

    This tab is available only to workstations on a PSTN network with a switched line.

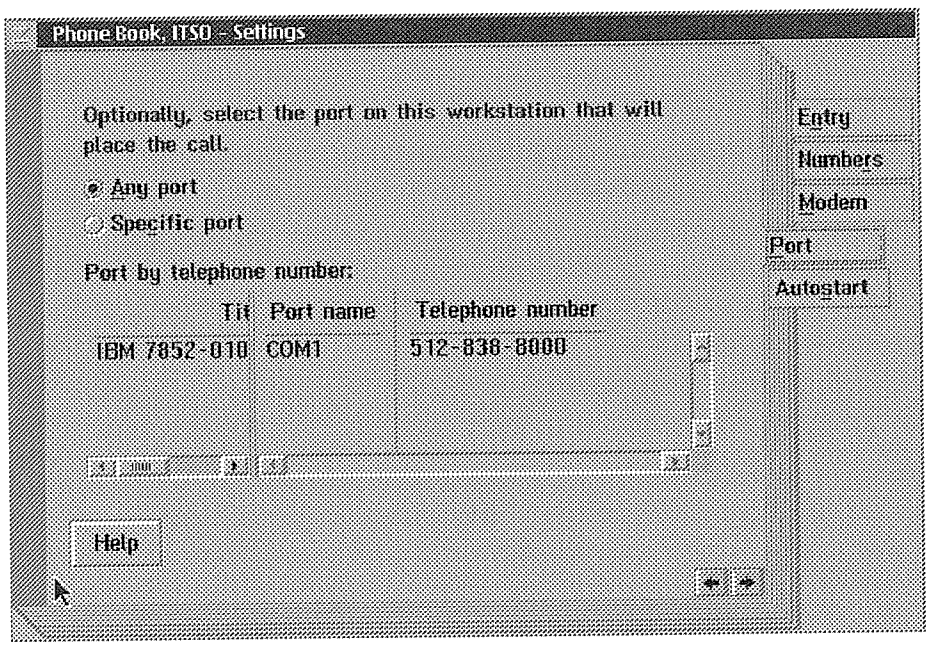


Figure 301. PhoneBook, New Entry - Settings Window (Port Section)

17. Select **Any port**.

Any port is used if you have more than one port for your modems. Select **Any port** if it does not matter which port is used to call this PhoneBook entry.

Note: If you have more than one port for your modems, select **Specific port** if you want to call this PhoneBook entry over a specific port and telephone number. You select the specific port and telephone number from the Port by telephone number list. Use Specific port if you have certain modems that are supporting the same high-speed protocol (and the other modems are not supporting this). Specifying the appropriate port would guarantee, for example in a callback environment, that the right modem calls back.

A list is available only if you have multiple ports. If your workstation is configured for only one port, the associated phone number is automatically listed here.

Port by telephone number lists the port name, the telephone number associated with the port, and the modem associated with the port.

18. Select the **Autostart** tab.

    The following window is displayed and is used to automatically start a LAN-based program with the workstation you call. The LAN-based program is started when you establish a connection.

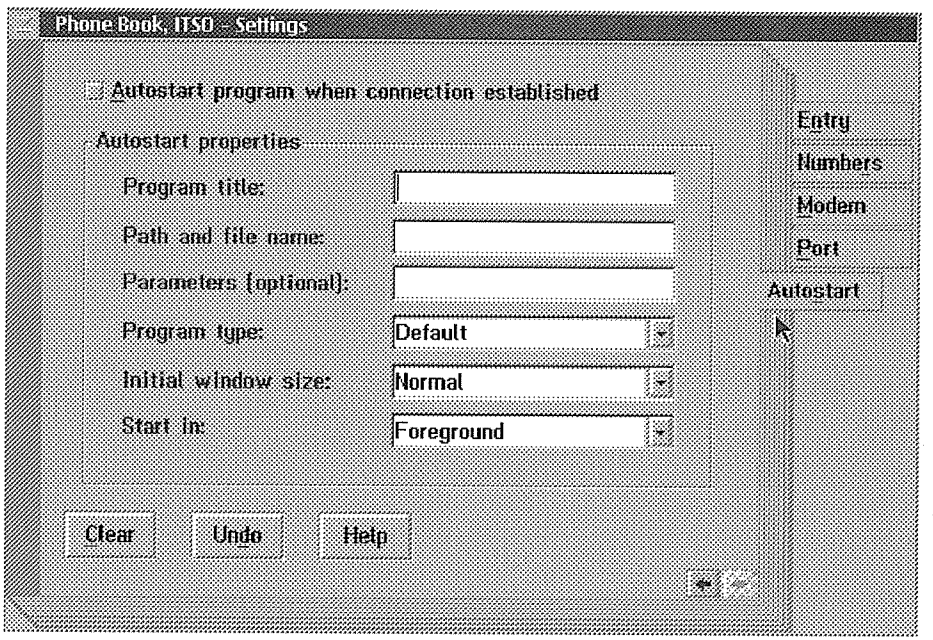


Figure 302. PhoneBook, New Entry - Settings Window (Autostart Section)

Note: In our example we don't configure that window.

19. Close the PhoneBook, New Entry - Settings window.

That brings you back to the Settings window shown in Figure 303 on page 535.

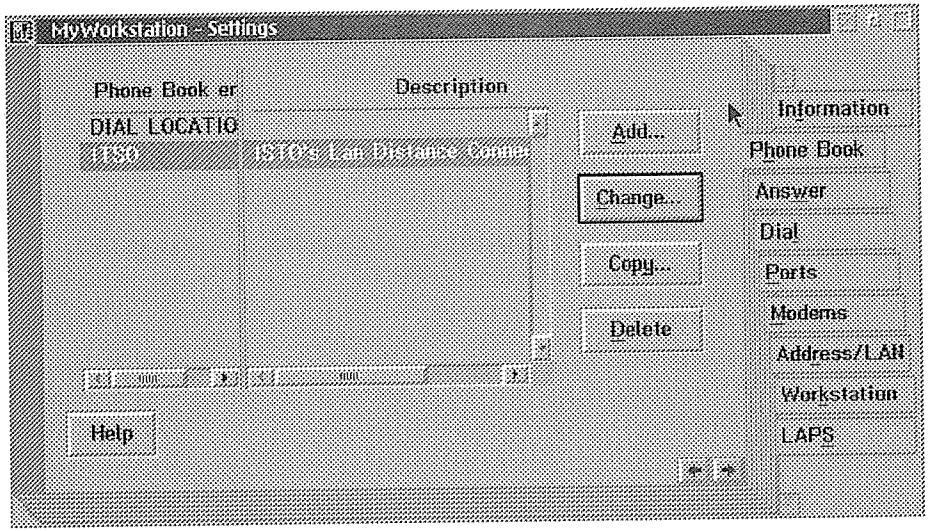


Figure 303. Settings Window

Here you can see that the user we configured before is now in the PhoneBook list.

5.9.6.8 Modifying LAPS

The Remote Access Client installation process either via the initial install of OS/2 Warp 4 or Selective Install for Networking adds both the LAN Distance Logical Adapter for the WAN connection and the real network adapter in LAN Adapter and Protocol Support (LAPS). This is automatically set up with installation of the Remote Access Client and it is recommended that you do not change this. It is important to realize that LAPS has two separate configurations when using the different shuttle modes: one in LAN Shuttle mode, the other in Remote Shuttle mode (please see 5.9.3, "Understanding the LAN Distance Shuttle Option: Remote versus LAN" on page 485 for an explanation of this). The LAN mode sets up the normal network adapter while the Remote mode sets up the LAN Distance Logical Adapter. The latter creates a virtual LAN environment to avoid any bootup errors when not connected to the LAN. If you do not install Remote Access Client at the initial install of OS/2 Warp 4 and use Selective Install for Networking, it is best to install the Remote Access Client *after* you have installed all of the other networking products you are going to use. This will ensure correct configuration of LAPS for the Remote Access Client.

If you do need to change any LAPS settings, do the following steps:

Note: If you do not see the LAPS tab, you must first use the scroll-down tab or maximize the window.

1. From the Settings notebook select the **LAPS** tab.
2. Select the **LAPS...** button to start the LAPS configuration.

   You now see the Configure Workstation window as shown in Figure 304 on page 536. You can see that in the Current Configuration section, the LAN Distance Logical Adapter with NetBIOS and the network adapter is installed. Other protocols such as TCP/IP and IBM NetWare Requester Support may also be present. This is where you can make changes or add adapters and protocols.

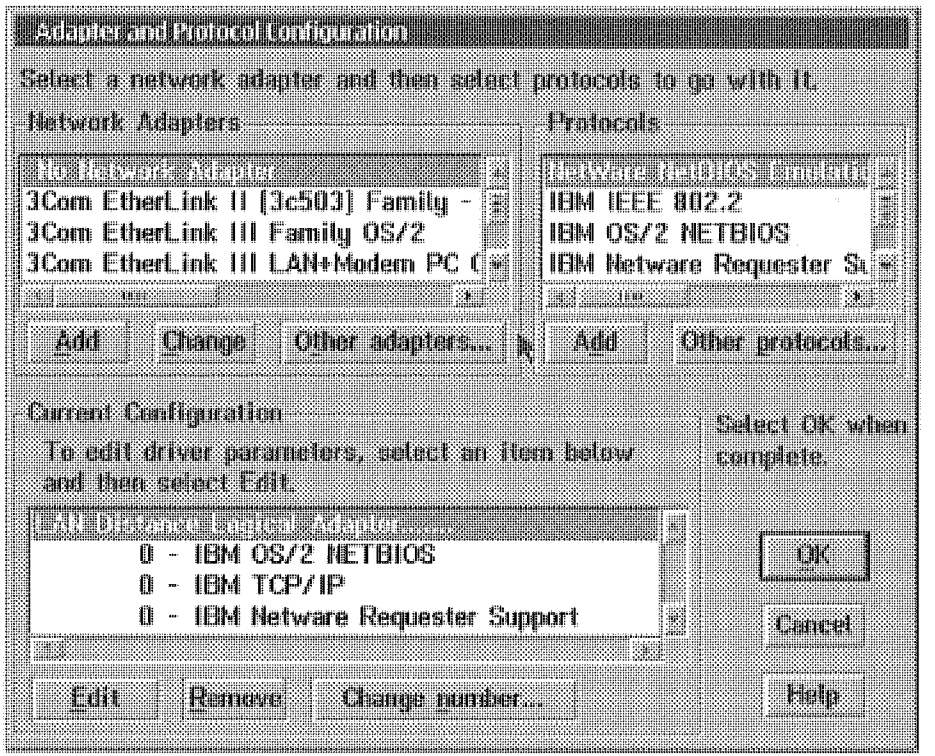


Figure 304. LAPS Configure Workstation Window

NetBIOS Requirement

NetBIOS is required by Remote Access Client for security and system management functions. If you delete NetBIOS, the Remote Access Client will not work (even if you have security disabled).

3. Select the **OK** button to finish the LAPS configuration.

5.9.6.9 Save the Configuration and Restart the Workstation

The Remote Access Client should now be fully configured and ready to make calls to a Warp Server Connection Server or a LAN Distance Connection Server or a remote workstation. The Remote Access Client must be shut down and the workstation restarted for the changes to take effect.

1. Close the MyWorkstation - Settings notebook window.

   You receive a message asking you if you want to save the Settings notebook values.

2. Select **Yes**.

   You receive a message telling you that some changes to the Settings notebook require you to stop and restart Remote Access Client. Other changes require you to shut down and restart the workstation.

   You can select the **Help** button to see what configuration changes require you to simply stop and restart Remote Access Client, and what configuration changes require the workstation to be restarted.

3. Select the **OK** button.
4. Stop all your running programs.
5. Shut down your system from the OS/2 desktop.
6. Restart your workstation (Ctrl-Alt-Del).
7. Start the Remote Access Client program from the desktop.

   You may wish to copy the Remote Access Client icon into the OS/2 Startup folder, so that Remote Access Client is started each time you start the workstation.

   The Remote Access Client is now configured and ready for operation.

5.10 TCP/IP Support in OS/2 Warp 4

OS/2 Warp 4 provides you with a full suite of applications that allow you to access TCP/IP networks. The most famous of these networks is the Internet, the largest and fastest growing network of computers and users in the world. OS/2 Warp 4 provides all the major communication protocols, tools and utilities that you require to connect to the Internet via a LAN or standard telephone line.

OS/2 Warp 4 provides all the network protocol support, tools and utilities to connect to other systems and access their resources using the TCP/IP protocol.

5.10.1 The TCP/IP Protocol

The strength of TCP/IP is that it is a widespread and flexible protocol that comes with a standard set of applications that are platform independent and can be used immediately.

The TCP/IP protocol is a multilayered protocol, and is available on almost every computer platform available. Although there are many modern protocols using better designs, such as SNA or OSI, TCP/IP became an industry standard due to its popularity and general availability.

4. Layer	Application	Telnet, FTP, e-mail, Gopher etc.
3. Layer	Transport	TCP, UDP
2. Layer	Internetwork	IP, ICMP, IGMP, ARP, RARP
1. Layer	Physical	Device to Interface Card, SLIP or PPP

Figure 305. Four-Layer Network Model

TCP/IP is called a layered networking protocol. Each layer has a different network responsibility. The layers on different hosts on a network will communicate, on a logical basis, with the equivalent layer on the other host, as indicated in Figure 306 on page 538.

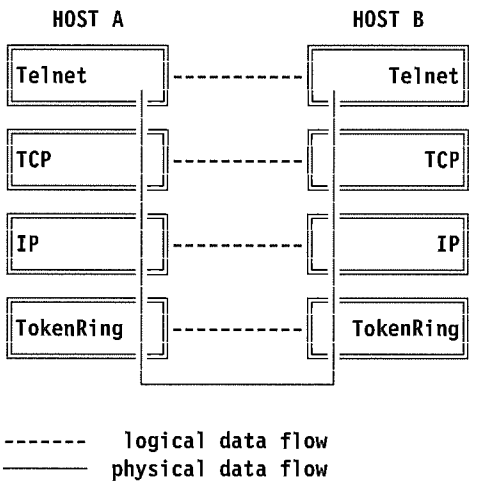


Figure 306. Inter-Layer Communication Model

For example, the IP internetwork layer on host A will communicate logically with the IP internetwork layer on host B across the Internet. The physical communication of data occurs on the physical link layer. Some applications do not have to use all four layers to communicate. For example, the PING command is based on the ICMP (layer), and uses only layers 1 and 2 to communicate with another host.

Note

Although the entire suite of protocols is commonly known as TCP/IP, TCP and IP are only two of the many protocols used on the TCP/IP Internet implementation.

The following sections will cover the major components of each layer in more detail.

5.10.1.1 SLIP and PPP

Two important protocols within the TCP/IP family are Serial Line Internet Protocol (SLIP) and Point-to-Point Protocol (PPP). These protocols allow a computer to connect to the Internet across a standard telephone line. When connected in this way, you can access all Internet facilities such as Gopher, e-mail and FTP as if your computer were permanently connected to the Internet.

The Internet dialers provided with OS/2 Warp 4 support both SLIP and PPP connections. While SLIP has historically been the most common connection method, PPP is rapidly emerging as a de facto standard. PPP offers several benefits over SLIP.

5.10.1.2 SLIP

SLIP (Serial Line Interface Protocol) is a simple form of encapsulation for IP datagrams on serial lines. SLIP has become popular for connecting home computers to the Internet through the RS-232 serial port. SLIP is a simple framing method. The IP datagram is terminated by an END (0xc0) character. To prevent noise from being interpreted as part of the datagram, the END statement is also transmitted at the beginning of the datagram. If a byte of data in the datagram equals the END character, a two-byte sequence (0xdb, 0xdc) is transmitted instead. This framing mechanism allows datagram packets to be transmitted effectively across a simple serial connection.

SLIP has the following deficiencies:

- Each end must know the other end's IP address.
- A serial line cannot be shared between SLIP and another protocol.
- There is no checksum added to the SLIP datagram. SLIP relies on error-checking modems or on the higher network layers to detect errors.

The IBM Global Network uses SLIP as its serial connection standard. Most UNIX systems include SLIP support in their base operating software. Another form of SLIP is compressed SLIP (CSLIP), which is better at handling small datagram packets.

5.10.1.3 PPP

PPP (Point-to-point protocol) is a serial line protocol similar to SLIP. PPP corrects many of the SLIP deficiencies and provides the following advantages:

- Support for multiple protocols across a single serial line
- A cyclic redundancy check on each datagram frame
- TCP header compression similar to CSLIP, making it potentially faster than SLIP

Since PPP provides distinct advantages over SLIP, it is the recommended protocol when starting up a serial-line-based IP network. When connecting into a service provider, you need to know which protocol it supports. You cannot connect into a SLIP line using PPP and vice versa.

Many service providers provide dynamic SLIP and PPP IP address resolution. That is, you enter your default IP address as 1.1.1.1 or 0.0.0.0, depending on the software you are using, and the service provider will then allocate an IP address from a pool of addresses that are available at that time. If you connect into the IBM Global Network using a SLIP connection, you have to specify your default IP address as 1.1.1.1.

5.10.2 Internet Protocol Addressing

Addressing within the Internet can be complex and confusing. Since the Internet is primarily based upon the TCP/IP protocol, Internet sites use the standard TCP/IP addressing mechanism known as *dotted decimal notation.* This form of addressing uses a four-part address where each part is a decimal number in the range 0 to 255. For example, the Internet home page for the IBM Global Network has the following address:

```
204.146.46.134
```

This form of addressing has a limitation because every computer on the Internet (both server and client) must have its own unique address. Dotted decimal notation is limited to approximately 4.2 billion addresses. With the Internet growing at its current rate of growth it is predicted that some classes of IP address will be exhausted soon after the turn of the century. To alleviate this situation, a system has been devised to split addresses, allowing multiple Internet sites to share addresses.

Because the complexity of addressing schemes become very confusing for the end user, an easier method was required, so today the Internet uses a system of *domain names.*

Domain names are resolved into Internet addresses by a machine known as a *domain name server*, which in itself is another computer on the Internet. Each subnetwork on the Internet typically maintains its own name server. Large networks, such as those maintained by Internet service providers, may have many name servers.

5.10.2.1 Dotted Decimal Notation (IP Addressing)

Internet addresses are 32-bit numbers, normally written as four octets. An octet is an 8-bit binary number (for example, 10101010). However, for ease of use, Internet

addresses are normally written in decimal form, not binary. An example of a binary octet could be:

```
00001001 00000011 00000001 01000111
```

The above 4-octet sequence represents an internet address. To handle this internet address more easily, let's translate each binary octet to a decimal number and separate them with a dot:

```
9.3.1.171
```

Much easier to handle, isn't it? The octet notation has the advantage of easy address class recognition.

5.10.2.2 Internet Address Classes

There are five different address classes: Class A, B, C, D, and E. Only the first three classes (A, B and C) are used for host addressing. The other classes are reserved for special purposes. In the case of class D, it is a multicast address used to enable routers to communicate with each other. Routers are a special combination of computer, connections, and software that connect networks to other networks.

We need different address classes because with 4 octets (32 bits) we are able to define up to 4.29 billion different hosts' addresses without any structure or control. Some bits of the internet address are used to identify a group of hosts. The following section explains the differences between the three address classes.

There are functional differences between classes as well as identifiers that place an address in a specific class. In order to tell what class an address belongs to, look at the first octet and specifically find the placing of the first zero "0" in the binary notation. The placing of this zero determines what class the address falls in. For example:

```
Class A: 0xxx xxxx xxxx xxxx
Class B: 10xx xxxx xxxx xxxx
Class C: 110x xxxx xxxx xxxx
Class D: 1110 xxxx xxxx xxxx
Class E: 1111 0xxx xxxx xxxx
```

Furthermore, each address class has its own specific address range as shown in Table 6 on page 541. Some values are reserved for special purposes.

Class	Lowest Address	Highest Address
A	0.0.0.0	127.255.255.255
B	128.0.0.0	191.255.255.255
C	192.0.0.0	223.255.255.255
D	224.0.0.0	239.255.255.255
E	240.0.0.0	247.255.255.255

Table 6. Address Ranges of Different Address Classes

By using this table you can quickly tell what class your Internet address falls into.

Based on the class of an address, you can determine how many bits are used for the network identifier and how many for the host identifier. In Figure 307 on page 542, you can see how many bits are used for the host and network ID in each class.

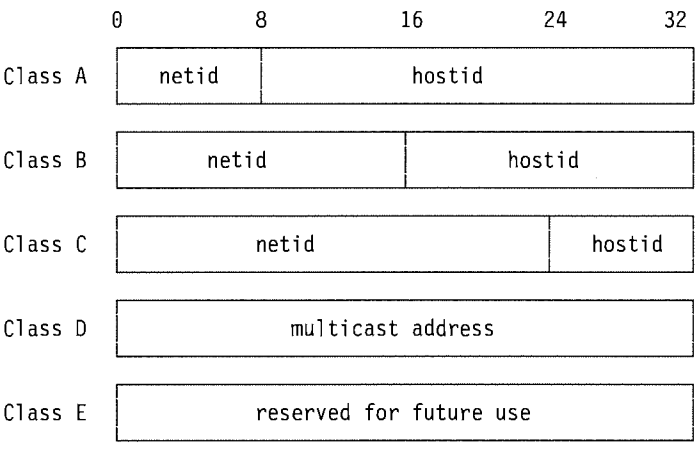


Figure 307. Different Types of Internet Address Classes

Large organizations or companies usually need class A or B addresses. Official network addresses are required only if you are going to access the worldwide Internet. Each host address must be unique. However, even if you are building an internal network, it is advisable that you obtain an official address. The official address will make network administration easier should you later decide to connect your network to the Internet.

When you obtain an official address, you will need to specify which class you want:

- Class A addresses allow for 128 networks with 16,387,064 hosts. This class is used by large organizations. When you obtain a class A address, you are assigned only the first octet (for example, 9).
- Class B addresses allow for 16,384 networks with 64,516 hosts. This class is used by organizations that want several networks with several hosts attached to each network. When you obtain a class B address, you will be assigned the first 2 octets (for example, 130.67).
- Class C addresses allow for 2,097,152 networks with 254 hosts. This class is good for a situation where there are a large number of networks with only a few hosts per network. When you obtain a class C address, you will be assigned the first 3 octets (for example, 220.132.11).

In an organization, there are typically three different types of IP hosts:

1. Hosts that require access to other hosts within the enterprise but not on the Internet
2. Hosts only requiring a limited set of outside services such as e-mail, FTP, and Newsgroups, that can be handled by application layer gateways and firewalls
3. Hosts that require full network layer access to other hosts on the Internet

For hosts that fit in the second category it is not necessary, and sometimes not even desirable, due to security reasons, to have network layer access to and from the Internet. For those hosts and the hosts from the first category, there is no need to use worldwide unique addresses. They must be unique within the enterprise. Only hosts of the last category must have unique addresses not only in an enterprise, but also on the Internet.

For hosts in the second category, the Internet Assigned Number Authority (IANA) has defined one address range per address class to use:

```
Class A:        10.0.0.0        to      10.255.255.255
Class B:        172.16.0.0      to      172.31.255.255
Class C:        192.168.0.0     to      192.168.255.255
```

If an enterprise is using addresses from one of the address ranges above, no permission by the IANA is required as these addresses do not have to be unique. They only have to be aware that those addresses cannot have a connection to another host in the Internet on the network layer, but only on the application layer.

5.10.2.3 Subnetting

Subnetting is the mechanism used to divide a TCP/IP network into several subnetworks. Class A addresses, for example, are designed to address more than 16 million hosts in one network. There are several technical and administrative reasons why you wouldn't want to setup a network with that configuration:

- You may be using more than one network topology, for example, token-ring and Ethernet.
- Performance would suffer if all hosts were on one physical network.
- Some network topologies have not been designed for such a huge number of hosts and therefore have design limitations.
- Point to point links; when numbers of a LAN are too far to connect using the preferred technology, the LAN is split into two and a high speed point-to-point link is used to connect the two LANs.

If an administrator decides to subnet the addresses he has control over, he must define how many bits of the address are used for the subnet and how many are used for the host. In Figure 307 on page 542, we said that an IP address is composed of a network ID and a host ID. In some cases, it is desirable to split the host portion into a subnet and a host ID.

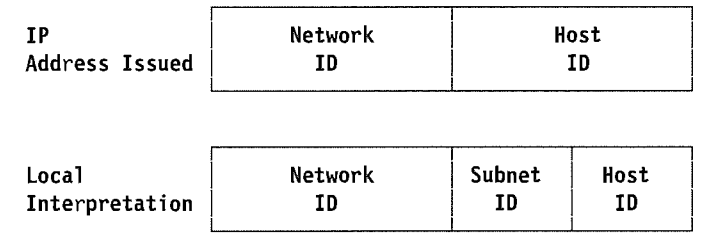


Figure 308. Local Interpretation of an IP Address

This split is possible because class A and class B addresses have a large number of bits allocated for the host ID.

For example, if the TCP/IP administrator within a large corporation decides to restructure the corporate network, she has to follow certain rules.

We'll assume the address range is from 9.0.0.0 to 9.255.255.255 and that the corporation has the following geographical data:

- Operates in six countries
- Has a maximum of 62 regions in any country
- Has a maximum of 126 branch offices per region

To address the 6 countries, she needs to take 3 bits from the host portion and allocate them to the network portion of the ID. For the maximum of 64 regions per country, another 6 bits are needed. For the maximum of 128 branch offices per region, yet another 7 bits are moved to the network portion of the ID. So, the address would look like the following:

```
nnnnnnnn.cccrrrrr.rbbbbbbb.hhhh

n: network
c: country
r: region
b: branch
h: host
```

To continue with our example, the 1st degree subnet defines that the first 11 bits (8 by default for a class A address and 3 for the country) are used for the network address and the remaining 21 bits are to be used for host addressing. The 1st degree subnetmask is:

```
11111111 11100000 00000000 00000000 (binary)
```

or

```
255.224.0.0 (dotted decimal)
```

For each country, we have to provide for a maximum of 64 regions. Add an additional 6 bits for the region identification as a second degree subnet:

```
11111111 11111111 10000000 00000000 (binary)
```

or:

```
255.255.128.0 (dotted decimal)
```

The 3rd degree subnets are defined by adding 7 bits to provide for the possibility of up to 126 branch office subnetworks in each region:

```
11111111 11111111 11111111 00000000 (binary)
```

or:

```
255.255.255.0 (dotted decimal)
```

In each branch office subnet, we can now use 8 bits to address a host (such as in a class C network). With 8 bits you can address 254 hosts. The first address (the .0 address) is used to address the network itself. The last address (the .255 address) is used for sending broadcasts over this subnet.

Let's assume that the U.S. gets the address (ccc=)1, the south-central U.S.A. gets the region code (rrrrrr=)1, the Education Support Center branch office in Austin, Texas gets the code (bbbbbbb=)1, and you have the host with the address 1 in this branch office. The address for host 1 of the ESC branch office in Austin, which is in the south-central region of the U.S. gets the following address:

```
nnnnnnnn cccrrrrr rbbbbbbb hhhhhhhh
00001001 00100000 10000001 00000001 (binary)
```

or:

```
9.5.129.1 (dotted decimal)
```

Without knowledge of the subnetmask, you interpret this address as network 9 and host 5.129.1. Each host *must* know the subnetmask of the (sub-)network in which it resides. To address another host in the same network, however, you do not need its subnetmask.

5.10.3 Domain Name System

The use of IP addresses and dotted decimal notation, although efficient and compact, can become particularly confusing when there are a large number of computers on a network. Users prefer to assign machines names that are easy to remember and pronounce. The domain name system (DNS) was designed to provide not only meaningful names to a large group of machines, but also a mechanism to map the high-level name to the IP address of the machine. The domain name system has a hierarchical format and is much easier for the user to use, but more complex for the IP network administrator to implement.

Let's go back to the example we used in the previous section. We now want a globally organized domain for the OS/2 support department and we want to call it:

```
os2.support.ibm.com
```

In the hierarchical scheme, this name reflects a four-level domain. The top domain or *.com* is a standard format to encompass commercial companies in the U.S. Its subdomain *.ibm* is the IBM corporate network, and *.support* is the support organization within IBM. Finally, *.os2* specifies the domain for all hosts within the OS/2 support group.

Individual computers on the Internet also use the domain name system. The hostname:

```
mozart.os2.support.ibm.com
```

may be a PC called mozart belonging to a Mozart fan club within the IBM OS/2 support group.

If you look at an Internet address such as:

```
Juergen@mailer.aix.support.ibm.com
```

it addresses the user Juergen on the host mailer that belongs to the domain aix.support.ibm.com.

Different composer aficionados on the OS/2 host mozart in the domain os2.support.ibm.com are addressed as:

```
SandroF@mozart.os2.support.com
```

or:

```
HerbieG@mozart.os2.support.com
```

The DNS protocol is used to communicate between different DNS servers because there is no single Internet site that knows all the domain name information.

5.10.3.1 Transmission Control Protocol (TCP)

The Internet Protocol (IP) is a protocol based on datagrams. Datagrams are sent through the network not sequentially and can therefore arrive in a very different order. Transmission Control Protocol (TCP) prevents this and provides a secure data stream for applications. Whenever an application is using TCP, it does not have to worry about whether the data stream sent is the same as the data stream received on the other side of a connection.

The following TCP/IP applications are using TCP as their communication protocol:

- Telnet
- FTP
- Finger
- NNTP
- POP

- Whois
- SMTP
- WWW
- Gopher

5.10.3.2 User Datagram Protocol (UDP)

The User Datagram Protocol (UDP) is an alternative to the TCP protocol. UDP and TCP are both based on the IP protocol. Applications using UDP cannot get a reliable connection to the remote application. If an application uses UDP, it has to check the order in which the data arrives plus check to see that all the data did, in fact, arrive.

UDP is used because of its speed, due to less overhead when compared to TCP. With TCP, the application has to establish a connection, transfer the data, and remove the connection after the data has been successfully transmitted. In contrast, with UDP the application sends a datagram to the remote host and simply assumes that it has arrived at the target correctly. Procedures are as simple as the following:

1. Send Data
2. Wait for a maximum of 5 seconds
3. If no acknowledgment is received, resend the datagram
4. Repeat up to three times
5. If still no acknowledgment is received, assume there is no connection to the remote host.

An example would be an application that has to make a simple *request-reply* call, such as for the resolution of a domain name, where you send a request to your name server and receive a simple answer.

5.10.3.3 Address Resolution Protocol (ARP)

The Address Resolution Protocol (ARP) is a very important protocol. ARP makes it possible to map an IP address to a hardware network adapter address within IEEE 802 networks (such as token-ring and Ethernet). This mapping is necessary because each network adapter has a unique address by which it can be identified in the network.

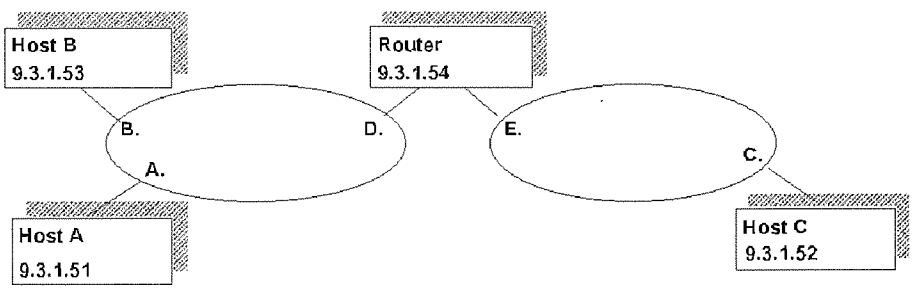


Figure 309. Example of ARP

Let's look at an example of ARP (see Figure 309 on page 547).

Host A wants to send an IP package to host B. Host A sends an ARP broadcast with the desired logical IP address to all machines on the LAN. If there is a host that matches the logical IP address (in our example host B) it answers that broadcast and provides Host A with its physical hardware address. Host A will store the association (between the logical IP address and the physical hardware address of Host B) in a temporary table with a timestamp. For all future IP packages addressed to host B, host A will know which physical hardware address to send to.

Let's look at what happens when host A wants to send an IP package to host C. Host C is not on the same LAN. As in the first example, host A will send an ARP broadcast, but this time the addressed host cannot answer because it cannot be reached by the broadcast. Host A will now try to reach the IP router and will get the physical adapter address of the router, as described in the first example. When it gets the hardware address of the router it will put the logical IP address of host C, associated with the hardware address of the router, in a temporary table. The next time host A has to send an IP package to host C, it will send it directly to the router.

5.10.4 TCP/IP Functionality in OS/2 Warp 4

The TCP/IP Base Kit Version 4 is available and included with OS/2 Warp 4. It includes the following functions:

Telnet	Terminal emulation
FTP	File Transfer
TFTP	Trivial File Transfer
REXEC	Remote command execution
RSH	Remote command execution
Remote Printing	Remote printers
SMTP	Simple Mail Transfer
WebExplorer	Display data/documents of the World Wide Web
Ultimail lite	e-mail handling
NewsReader/2	Handling of newsgroups
TALK	Online chat
Routing	OS/2 Warp 4 as a router
ARP	Hardware address resolution
PING	Request ping-echo from remote machine
BOOTP	Get configuration
DHCP	Dynamic Host Configuration Protocol

DDNS	Dynamic Domain Name Server registration
WinSock Support	Windows WINSOCK TCP/IP API support
DBCS Support	Double Byte Character Set support
SLIP	Serial Link (Modem)
PPP	Point-to-Point Link (Modem)
Configuration Notebook	Central TCP/IP configuration in OS/2 Warp 4

There are a variety of IBM TCP/IP for OS/2 packages that address different requirements:

- The TCP/IP Base Kit (shown above, included in OS/2 Warp 4)
- Network File System Kit
- TCP/IP for OS/2 Programmer's Toolkit
- X Window System Server Kit
- X Window System Client Kit
- OSF/Motif Kit
- Extended Networking Kit (X.25, SNA Link)

5.10.4.1 TCP/IP Servers Included in OS/2 Warp 4

The following servers are included in OS/2 Warp 4:

TELNETD	Allows remote hosts to log in in your host via TELNET VT100 or ANSI emulation.
FTPD	Supports file exchange with other hosts.
TFTPD	Supports file exchange using the Trivial FTP.
REXECD	Executes OS/2 commands issued from a remote TCP/IP host.
RSHD	Executes OS/2 commands issued from a remote TCP/IP host.
lpd	Makes it possible to share a printer through the TCP/IP network.
INETD	Saves system resources, most TCP/IP servers can be started within this process.
lprportd	Enables the use of the \pipe\lpdx queues for remote printing.
SENDMAIL	Implementation of the SMTP to send and receive mail from other hosts.
UltiMail Lite	MIME-compliant mailing program to connect to a POP server.
TALKD	Tool to do interactive conversation with other users in the TCP/IP network.

ROUTED Router that implements the RIP protocol in OS/2 Warp 4.

Portmap Maps RPC programs and version numbers to dynamic port addresses. Every application that uses RPCs (such as NFSD) needs the portmapper running.

BOOTPD Sends out an IP configuration to a host that is broadcasting for it. Not to be mistaken for DHCP and DDNS. BOOTP has a fixed relation between the IP configuration and the network adapter address of the requester.

5.10.5 Dynamic IP (DDNS/DHCP)

This section describes the concepts of Dynamic Host Configuration Protocol (DHCP) and Dynamic Domain Name Services (DDNS) as introduced with TCP/IP 3.1 in OS/2 Warp Server. In addition, this section provides helpful hints for the configuration of a DHCP client. OS/2 Warp 4 TCP/IP Version 4 provides support for a dynamic IP client.

5.10.5.1 Introduction

Before the introduction of DHCP and DDNS, the setup of a new TCP/IP host in the network was tedious. The network administrator had to assign an address to the new host, then the host was configured using the information required for its location such as:

- IP address
- Subnet Mask
- Host Name
- Name Server address
- Router address
- Domain Name Server address
- Printer address
- News Server address
- SOCKS Server address
- Other, depending on location implementation

When a parameter changes, each host needs to be reconfigured. For a mobile TCP/IP user, the issue is even more compelling because a different address must be kept for the user in each location and he has to reconfigure his workstation's TCP/IP parameters every time he changes to a new location. To make matters worse, the mobile user uses only one of his addresses at a time and the unused addresses at the other locations are not available to other users.

This situation can be improved by using the BOOTP protocol. BOOTP uses UDP (described earlier) and IP to initiate a single packet exchange. This one exchange specifies, to the host, many of the parameters it requires at startup (IP address, router

address, server address, etc.). When the host boots, it broadcasts a BOOTP request. A server, configured to respond to the request, broadcasts a reply to the booting host. The reply contains an address from a pool of addresses (and other information), which is configured in a central place. Using this process, a mobile client can automatically get different configurations depending on the location he is attaching in. The booting host (mobile client) would not even need to know the address of the BOOTP server because it broadcasts its request for parameters.

DHCP extends the function of BOOTP to provide dynamic address assignment. To make automatic configuration possible, an administrator allocates a pool of IP addresses for the DHCP server to manage. A DHCP client exchanges messages with the DHCP server to negotiate the lease of an address.

1. DHCP server owns pool of IP addresses
2. DHCP client initiates negotiation for an address
3. DHCP server offers address
4. Client accepts address
5. Client uses address
6. Address lease expires
7. DHCP server puts IP address back in pool

Dynamic addressing is different from static addressing in which addresses are issued permanently. Because the dynamic address is issued temporarily, we say that a DHCP server *leases* the address to the client for specified period of time. During the lease time, the server will not lease the address to another requesting client. Sometime before the lease time expires, the client must renew the lease or stop using the address.

5.10.5.2 Dynamic Domain Name Services (DDNS)

To use a DHCP and DDNS facility, a DHCP client needs a DHCP Server somewhere on the network. OS/2 Warp Server provides support for both DHCP and DDNS servers. However any DHCP server can be used. Most DHCP server implementations follow the same open protocol and although they may vary in functionality, they all provide the same basic parameters.

To provide the dynamic host name update to go with the dynamic address, a DDNS server is used in conjunction with the DHCP server. Dynamic Domain Name Service (DDNS) is a superset of the normal Domain Name Service (DNS). The DDNS server receives requests from the DDNS client to associate an IP address (ipdr) with a host name or a host name to an IP address (A-record). The DHCP client is responsible for updating its name (A-record update) and the server is responsible for updating the ipdr record.

5.10.5.3 Requesting an IP Address Via DHCP

This section provides background information regarding the dialog that takes place between a DHCP client (such as an OS/2 Warp 4 DHCP TCP/IP Client) and a DHCP server (such as an OS/2 Warp Server DHCP Server).

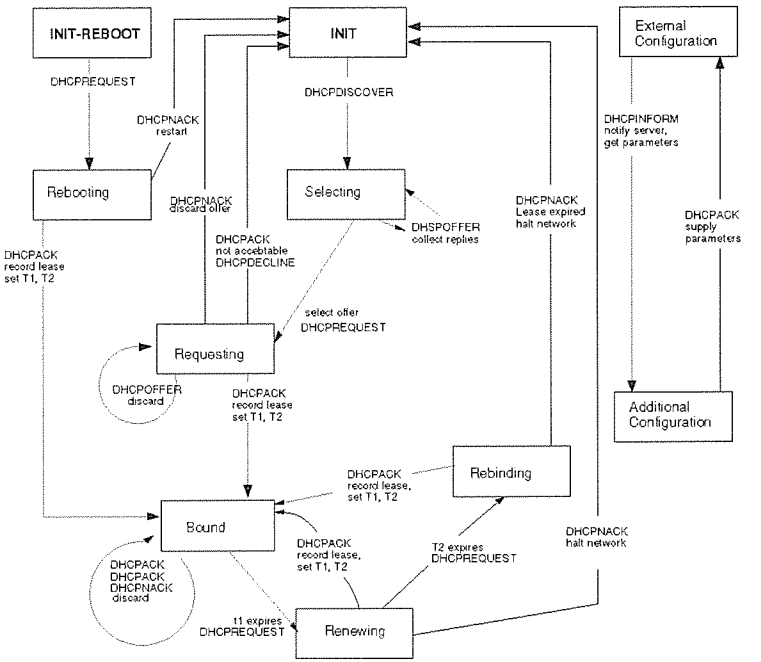


Figure 310. DHCP Client State Transition Diagram

1. Lease Acquisition - When a client boots, it enters the INIT state.
2. To begin the process of acquiring an IP address, the client uses UDP to broadcast a DHCPDISCOVER message and moves on to the Selecting state.
3. All DHCP servers on the local net receive the DHCPDISCOVER message and those that are configured to respond, send a DHCPOFFER message.
4. The client, still in Selecting state, collects DHCPOFFER responses from the DHCP server(s). Each of these offers contains an IP address and configuration information that the server is offering for the client to use.
5. The client chooses one of the responses by sending a DHCPREQUEST message and begins to negotiate with the server for a lease.
6. At this point, the client enters Requesting state.

7. The server receives the DHCPREQUEST message and responds by sending a DHCPACK message to the client.
8. The client receives the DHCPACK message and moves into the Bound state and begins to use the address. Bound is the normal state of operation.
9. Lease Renewal - Upon entering the Bound state, the client sets three timers that control lease renewal, rebinding and expiration. The values for these timers can be specified by the DHCP server, or else the client uses defaults:
   - Value 1 (T1) = total lease time / 2
   - Value 2 (T2) = 87.5% of the lease period
   - Value 3 (T3) = 100% of the lease period
10. When T1 expires, the client requests a lease renewal by sending a DHCPREQUEST (containing the IP address it is using) to the DHCP server from which it obtained the lease.
11. The client moves into the Renewing state to await a response.
    - If the server approves, it sends, to the client, a DHCPACK and the client returns to the Bound state.
    - If the server disapproves, it sends to the client a DHCPNACK and the client returns to the INIT state.
12. If the second timer (T2) expires before the server responds, the client moves to the Rebinding state and begins to broadcast a DHCPREQUEST to any DHCP server on the network.
    - If the client receives a positive response from another DHCP server, it returns to the bound state (using the same address) and T1 and T2 are reset.
    - If the client receives a negative response from all servers, it must discontinue use of the IP address.
13. If the client, while in Rebind state, receives no positive response from any DHCP server, the third timer expires and the lease expires and the client must begin the process of acquiring a new address.
14. Lease Termination/Renewal - When it no longer needs a lease, DHCP allows a computer to terminate a lease without waiting for it to expire. The client sends a DHCPRELEASE message to the server (this would happen, for instance, when the machine shuts down).

5.10.5.4 Configuring the DHCP Client

The DHCP Client is configured very easily. Most of the work is done by the administrator of the DHCP server.

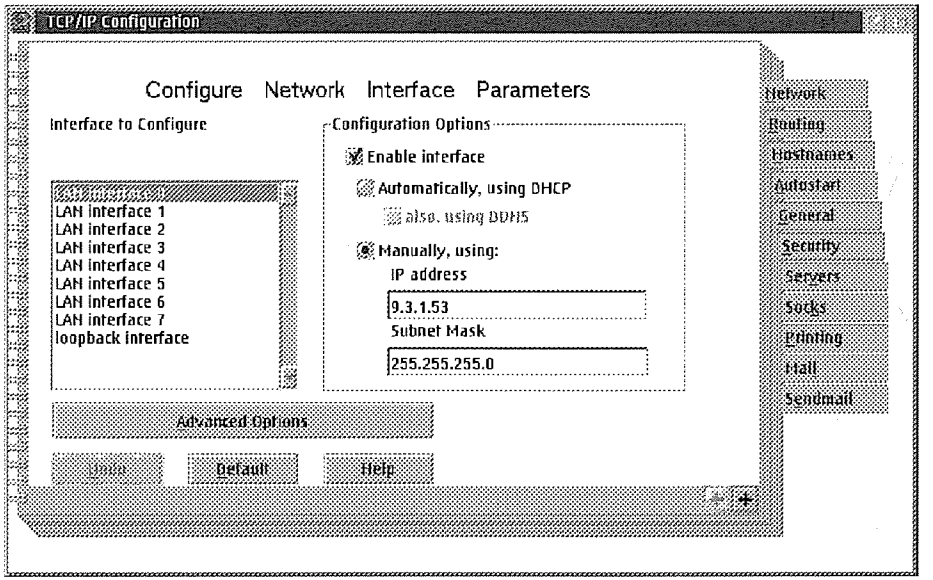


Figure 311. TCP/IP Configuration Panel - Configure the DHCP Client

To configure the client, open the TCP/IP Configuration notebook in the Internet (LAN) folder. On the first page (see Figure 311 on page 554) the LAN interface has to be enabled. The LAN Interface 0 is the definition interface to your first LAN adapter, LAN Interface 1 to the second and so on. Select the LAN interface you want to customize and then select the **Automatically, using DHCP** option instead of configuring the adapter with IP, subnetmask, etc. Select the **DDNS** option if a DDNS server is available. This is all that is required to configure a DHCP client.

Close the configuration notebook and restart the TCP/IP configuration either by rebooting the system or by executing SETUP.CMD from the ETC directory (by default this is the \mptn\etc\ directory).

It is best to use SETUP.CMD rather than TCPSTART.CMD. TCPSTART.CMD calls SETUP.CMD but it also starts all the TCP/IP services you have selected before and that are already started. SETUP.CMD contains all the necessary configuration information for the LAN adapters. It starts the DHCP client and defines the router entries.

5.10.5.5 DHCP Monitor

In the System Setup folder of OS/2 Warp 4 you can find two additional new objects regarding DHCP and DDNS.

One is the DHCP Monitor. The DHCP Monitor has no configuration function at all. It displays the current state (see Figure 312) of the configuration and the configuration data provided by the server (see Figure 313 on page 556).

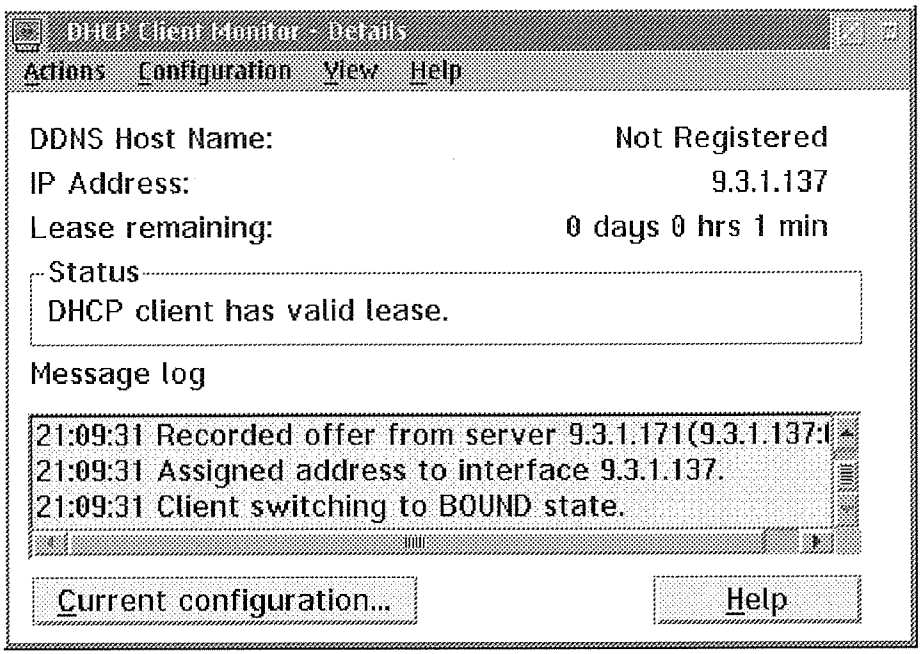


Figure 312. DHCP Monitor

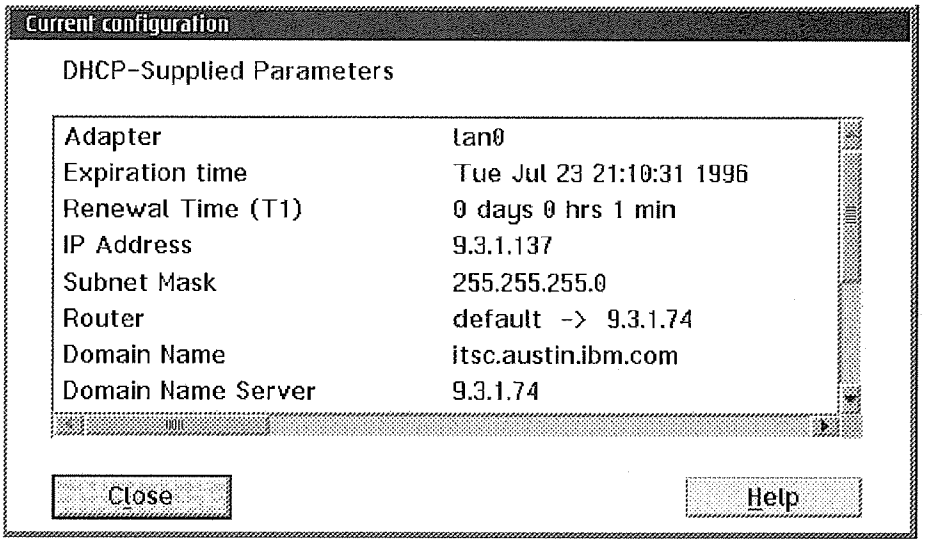


Figure 313. DHCP Monitor - View Configuration

The state of the host running the DHCP client can also be checked using the icon that the DHCP Monitor has in the Minimized Objects folder or in the upper left corner of the DHCP Monitor. In fact, there are 3 states:

means that everything is fine

means that the IP addressing is still active, but the DHCP client was not able to renew the lease yet.

means that the DHCP client was not able to renew the address or even get a new one from any other host in the LAN. No valid IP address is configured anymore.

5.10.6 DDNS Object

The DDNS object is used to make your machine known to the domain name server in the current domain so that your machine can be addressed by its domain name. If you have selected to use DDNS in the TCP/IP Configuration notebook, it is automatically executed after reboot.

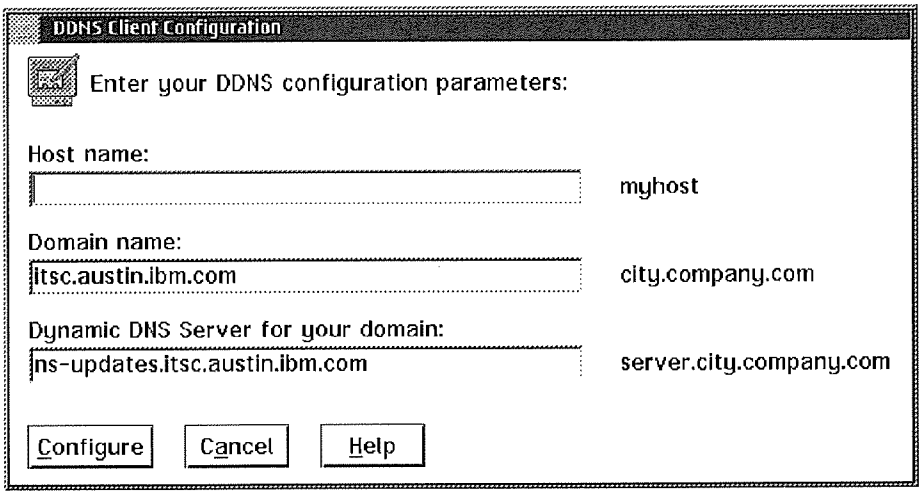


Figure 314. DDNS Configuration Window

After you have configured the Dynamic Domain Name System (DDNS) client information using the dialog window in Figure 314 on page 557, other users will be able to contact you through the network using your host name rather than having to specify your Internet (IP) address.

The DDNS Client Configuration main window contains three input fields:

- Host name field
- Domain name field
- Dynamic DNS Server for your domain field

All fields are mandatory but the Domain Name field and the Dynamic DNS Server for your Domain field could already be configured automatically by the information that the DHCP client received. If not, you can contact the TCP/IP administrator to obtain this information.

You can overwrite this information with other valid entries. You provide the entry in the Host Name field. By default the DDNS client will put in the host name that you have defined in your TCP/IP configuration for your machine.

5.10.7 The TCP/IP Configuration Notebook

The TCP/IP Configuration notebook is a central place in OS/2 Warp 4 where you can configure nearly all TCP/IP services via a graphical interface. Many services can be configured without this tool but it is much easier to use the graphical interface. You can find the TCP/IP Configuration Notebook in the Internet (LAN) folder.

When you open the TCP/IP Configuration notebook you'll see a window as shown in Figure 315 on page 559. From this figure you can see that the TCP/IP Base kit included in OS/2 Warp 4 has been installed. There are several additional kits that can be installed over the base kit, for example the NFS Kit or the PMX Kit. Each additional TCP/IP kit will extend the configuration notebook by adding its own tabs and pages to configure its services.

After the configuration is done, you have to activate the configuration changes. The surest way is to reboot the system, but this is often not necessary. If you changed the configuration to your network interface, it is enough to run the SETUP.CMD, located in the \MPTN\BIN directory. If you added server services on the Autostart page, running TCPSTART.CMD should be enough. Servers that have been started already are not reconfigured. Changes that have been made in the CONFIG.SYS require a reboot. Several changes in the configuration files (such as SOCKS) are activated immediately without any reboot or running of CMD files.

The absolute minimum configuration required to get a TCP/IP connection to another host is located on the Networking page: Enable an adapter and configure the Internet Address and the Subnetmask (if needed).

With this information, you can connect to a host in the same subnet. If you are using a DHCP server to configure your system dynamically, select the **DHCP** check box on the networking page. If not, you have to define the following information to get access to other hosts in other networks:

- Default Router (if available) on the Routing page
- Domain Name Server (if available) on the Hostnames page
- Domain Name (if available) on the Hostnames page

The following is an overview of what the TCP/IP configuration notebook contains with only the TCP/IP base kit installed.

5.10.7.1 The Networking Page

On the configuration page shown in Figure 315 you can define the basic IP definitions for each adapter. As you can see in the left list box, you can define up to 8 LAN adapters. The loopback adapter can be used when you do not have a physical adapter but want to use IP for demonstration or testing purposes. The default address that is configured for the loopback adapter is 127.0.0.1.

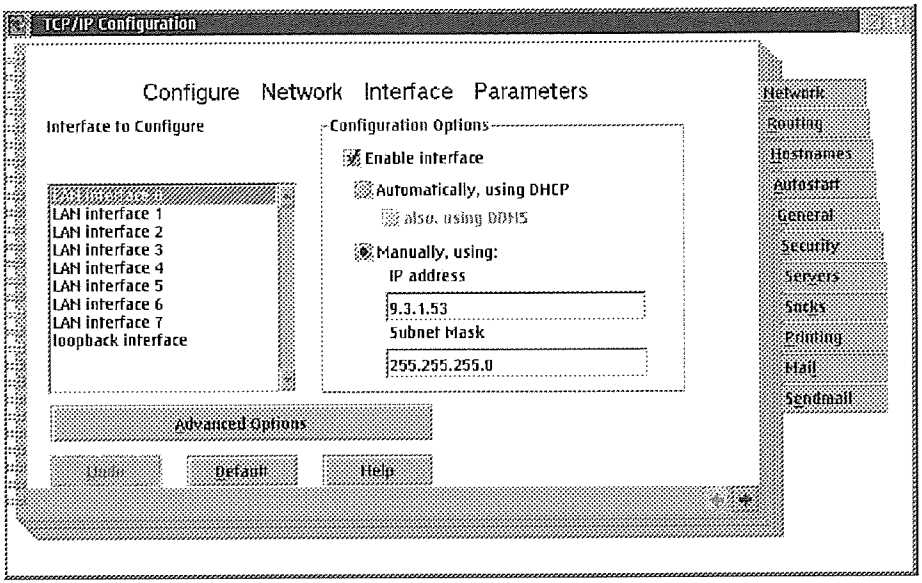


Figure 315. TCP/IP Networking Configuration Page

The configuration options contain the local IP address and the subnet mask. Additional parameters can be specified in the Advanced Options section including information regarding the broadcast address that is used. If no broadcast is defined, the default broadcast for your subnetmask is used. If you do not want to configure the IP address but get the configuration automatically from a DHCP server, just select the **Automatically, using DHCP** check box.

5.10.7.2 The Routing Page

The routing page allows you to define the IP routing instructions for your network. If you use a default router, the configuration will always add the NET routing path for your main IP network. In the example shown in Figure 316, the NET routing path is 9. The 9 is there because whenever you link to a SLIP or PPP Internet connection and LAN connection simultaneously, the default routing path is overwritten by the network dialer during the modem connection. With the NET routing path, you can still access IP addresses through the LAN. If there are even more addresses that you can access through the LAN, you can add them to this page.

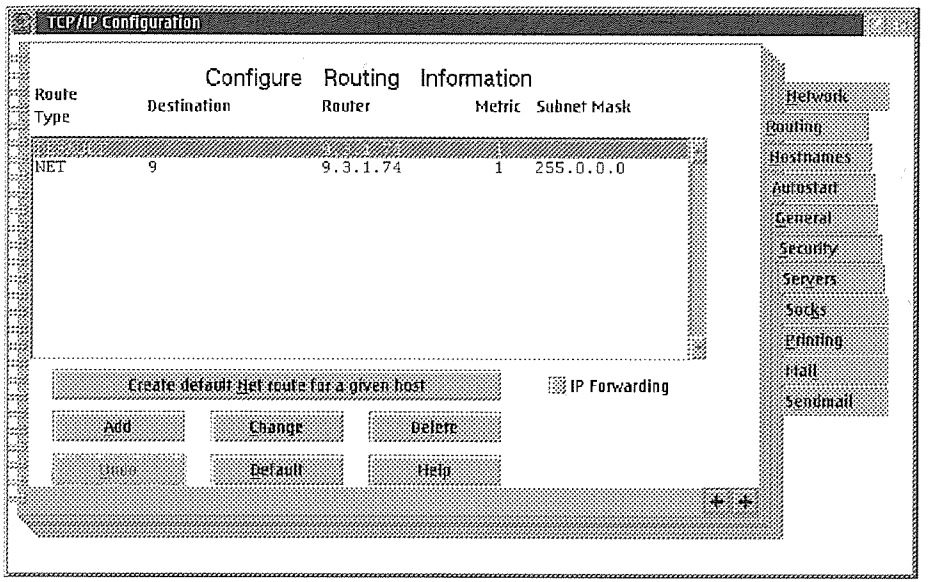


Figure 316. TCP/IP Routing Configuration Page

To use your PC as a static routing client, you can click on the **IP Forwarding** check box.

To add a router, click on the **Add** button. A window as shown in Figure 317 appears. To define a default router, select the Router Type and press the D (for default) key. Then go to the router address and enter the address. To complete the definition, click on **OK**.

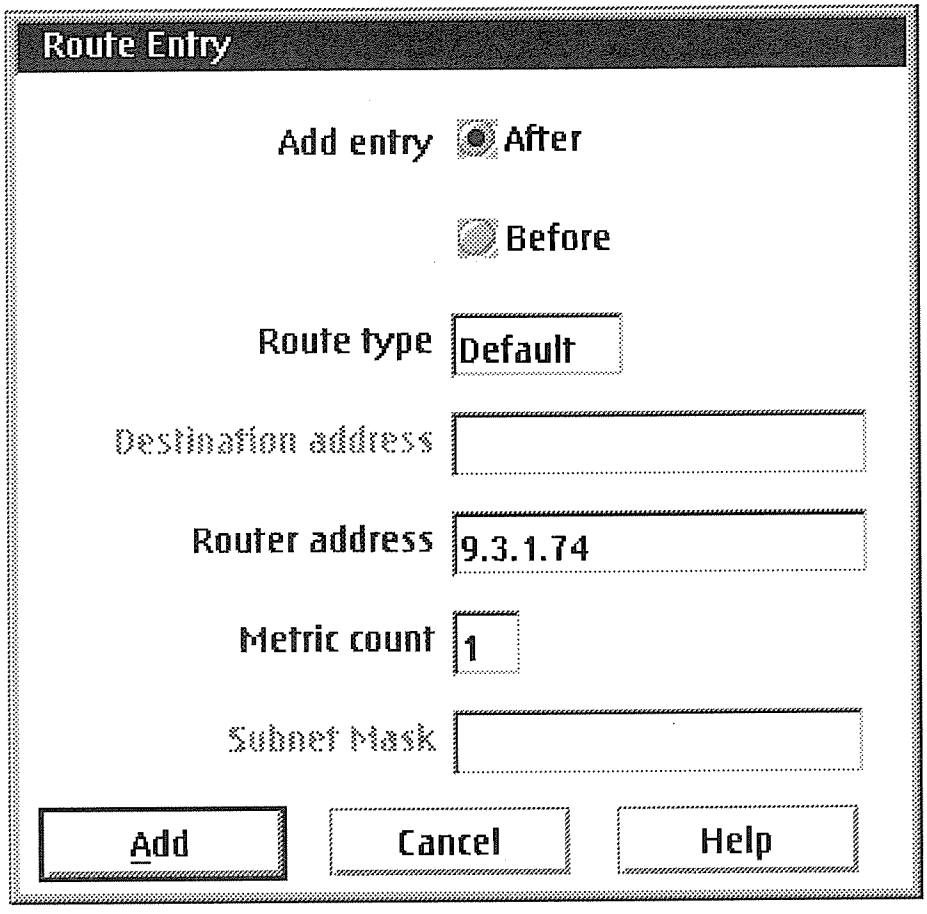


Figure 317. Defining a Routing Path

5.10.7.3 The Hostnames Pages

The first Hostname page gives you the ability to define a default host name for your machine. When you use the entry field, an environment variable called HOSTNAME will be defined in the CONFIG.SYS file. If you are using DDNS, this name will also be the suggested name that the DDNS client will provide you with.

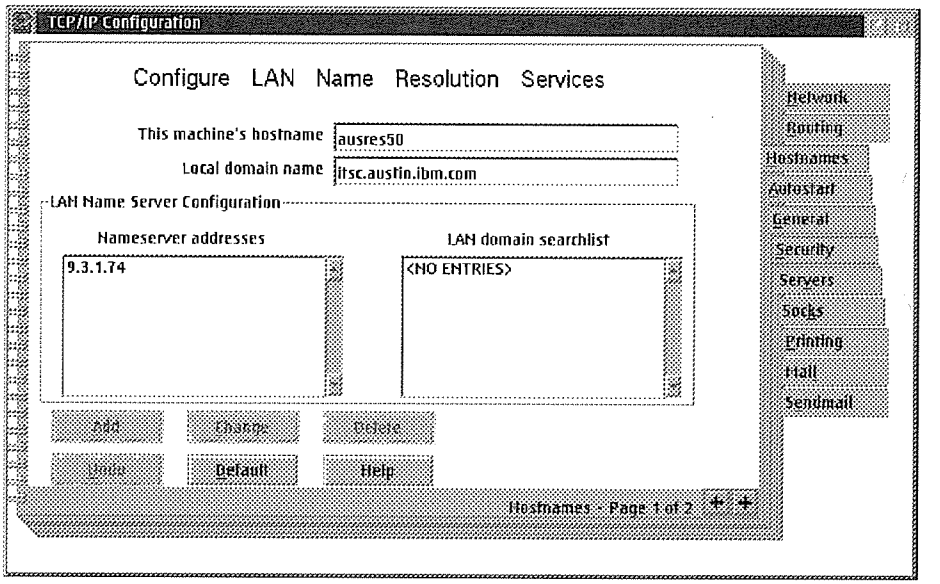


Figure 318. TCP/IP Hostnames Configuration Page 1/2

If you do not obtain the domain name from the DHCP server, you can specify one in the Local domain name entry field. In a small LAN with no DNS server, there is no need to use this field.

In the Nameserver addresses list box, you have the ability to define up to three name servers that are doing the translation between IP address and host name. The name servers must be specified with by IP address. This is also information that can and should be obtained by the DHCP server, if you are using it. If not, you should ask the local TCP/IP administrator.

The LAN domain searchlist list box gives you the ability to search in domains other than the current one.

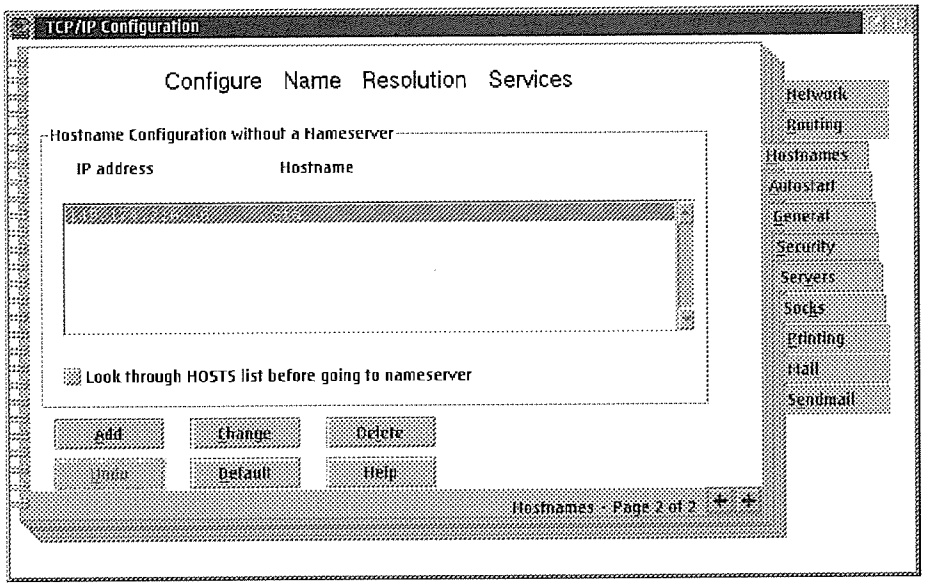


Figure 319. TCP/IP Hostnames Configuration Page 2/2

The second Hostnames page in the TCP/IP configuration notebook allows you to define your own aliases on the local host. In the example shown in Figure 319 on page 563 the alias is CIS, which can be used instead of the full name compuserve.com.

Click on the **Look through HOSTS list before going to nameserver** check box to specify that name resolution takes place by using the \ETC\HOSTS file first before sending a request to the remote name server.

5.10.7.4 The Autostart Page

Using the Autostart page, you can define which TCP/IP servers are started automatically. In the list box on the left side you can select the server you want to autostart (see Figure 320).

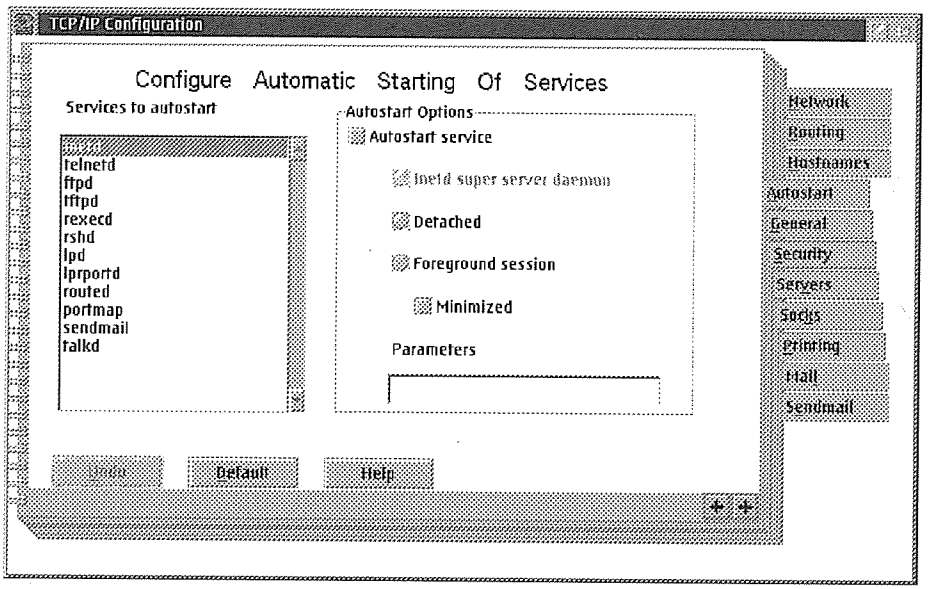


Figure 320. TCP/IP Autostart Configuration Page

On the left side of the page you select the service to be started automatically. On the right side under Autostart Options you can specify how the selected server (also called daemon) has to be started.

Type	Description
inetd super server daemon	The selected server will be started as a part of the inetd daemon to save system resources. If a server is started in this mode, it will not use the parameters specified in the Parameters entry field. (see 5.10.9, "The INETD Super Server Daemon" on page 579 for more details about inetd).
Detached	The selected server will be started in a separate session, but not be shown in the task list.
Foreground Session	The selected server will be started in a separate session as with Detached, but the session is visible in the task list. If you wish to start the server minimized, select the **Minimized** check box.
Parameters	In this line you can specify any parameters you want to pass to the selected server that has to be launched. When launching the selected server as

a part of the inetd daemon, this field is ignored and grayed out.

When you select a server that requires another server to be started, the configuration tool will remind you of this. If some additional kits are installed, their daemons can also be autostarted from this menu.

All changes made are stored in the TCPSTART.CMD file in the \TCPIP\BIN directory. This file is used to start services when your system is booted. TCP/IP for OS/2 creates an object in the Startup folder called TCP/IP Startup.

5.10.7.5 The General Configuration Page

On this page you can define the default user name for your system. This entry will define a environment variable USER in the CONFIG.SYS. This variable is used when TCP/IP requires a user ID.

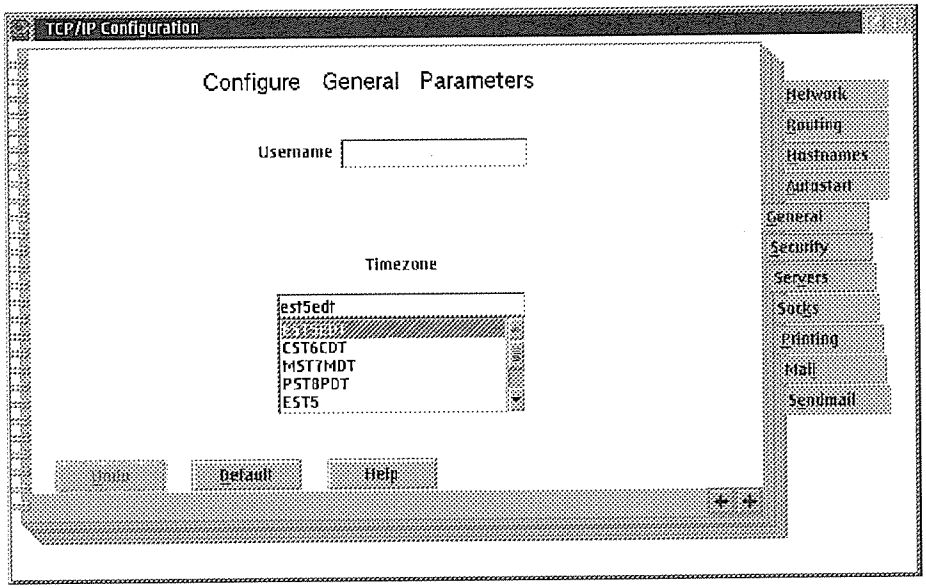


Figure 321. TCP/IP General Configuration

In the Timezone entry field you can set the time zone in which your system resides. This is used whenever there is a need to make calculations across machines in different time zones. This entry field defines the TZ (time zone) environment variable in the CONFIG.SYS system file.

The format of the TZ variable is:

```
SET TZ=SSS[+/-]h[:m:s]DDD,sm,sw,sd,st,em,ew,ed,et,shift
```

where:

[ ]	Anything in between square brackets is optional
,	Commas are mandatory separators between Daylight Savings Time parms. See the examples below.
SSS	Is a 3-character Standard (or winter) time zone.
+	Optional direction from GMT/UTC + = West + (west) is the default if not specified.
-	Optional direction from GMT/UTC - = East
h	Standard time zone difference in hours from GMT/UTC.
:m:s	You can optionally specify the minutes and seconds after the hour.
DDD	Is a 3-character Daylight Savings (or summer) time zone.
sm	Is the Daylight Savings Time starting month 1 through 12. Default is 4 (April).
sw	Is the Daylight Savings Time starting week -4 through 4. Use negative numbers to count back from the last week of the month (-1), and positive numbers to count forward from the first week (1). Default is 1.
sd	Is the Daylight Savings Time starting day. If the Starting week is not 0, then 0 through 6. If the starting week is 0, then 1 through 31. Default is 0 (Sunday).
st	Is the Daylight Savings Time start time in seconds. Default is 3600 (1 AM or 01:00).
em	Is the Daylight Savings Time ending month 1 through 12. Default is 10 (October).
ew	Is the Daylight Savings Time ending week -4 through 4. Use negative numbers to count back from the last week of the month (-1), and positive numbers to count forward from the first week (1). Default is -1 (last week of the month).
ed	Is the Daylight Savings Time ending day. If the Ending week is not 0, then 0 through 6 If the ending week is 0, then 1 through 31. Default is 0 (Sunday).
et	Is the Daylight Savings Time end time in seconds. Default is 7200 (2 AM or 02:00).
shift	Is the amount of time in seconds to shift in going from standard to savings time. Default is 3600 (1 hour).

Examples of the TZ variable are:

TZ=EST5EDT,4,1,0,3600,10,-1,0,7200,3600

Normal zone is EST, which is 5 hours less than (5 hours west of) GMT/UTC and EDT starts on the first Sunday of April at 2AM and ends on the last Sunday of October at 4 AM and shifts by 1 hour.

SET TZ=CST6CDT,3,0,15,3600,10,0,27,7200,3600

Normal zone is CST, which is 6 hours less than (6 hours west of) GMT/UTC and CDT starts on the March 15 at 2AM and ends on October 27 at 4 AM and shifts by 1 hour.

SET TZ=EST-10EDT,10,-1,0,3600,3,1,0,7200,3600

Normal zone is EST, which is 10 hours greater than (10 hours east of) GMT/UTC and EDT starts on the last Sunday of October at 2AM and ends on the first Sunday of April at 4 AM and shifts by 1 hour.

SET TZ=GMT0BST,3,0,31,3600,10,-1,0,7200,3600

Normal zone is GMT, which is 0 hours less than GMT/UTC and BST starts on the March 31 at 2AM and ends on the last Sunday of October at 4AM and shifts by 1 hour.

SET TZ=NST3:30NDT,4,1,0,3600,10,-1,0,7200,3600

Normal zone is NST, which is 3 hours and 30 minutes less than (3 hours, 30 minutes west of) GMT/UTC and NDT starts on the first Sunday of April at 2AM and ends on the last Sunday of October at 4 AM and shifts by 1 hour.

It is not necessary to set the TZ variable exactly in order to use TCP/IP, but whenever TCP/IP communication gets a global character and there is a need to calculate time differences between machines, the correct setting is needed.

5.10.7.6 The Security Configuration Pages

The security page allows you to define user IDs and passwords for the various TCP/IP services. On the first page (shown in Figure 322) you can enter a password for the telnetd daemon. The password will be set in the CONFIG.SYS as the TELNET.PASSWORD environment variable.

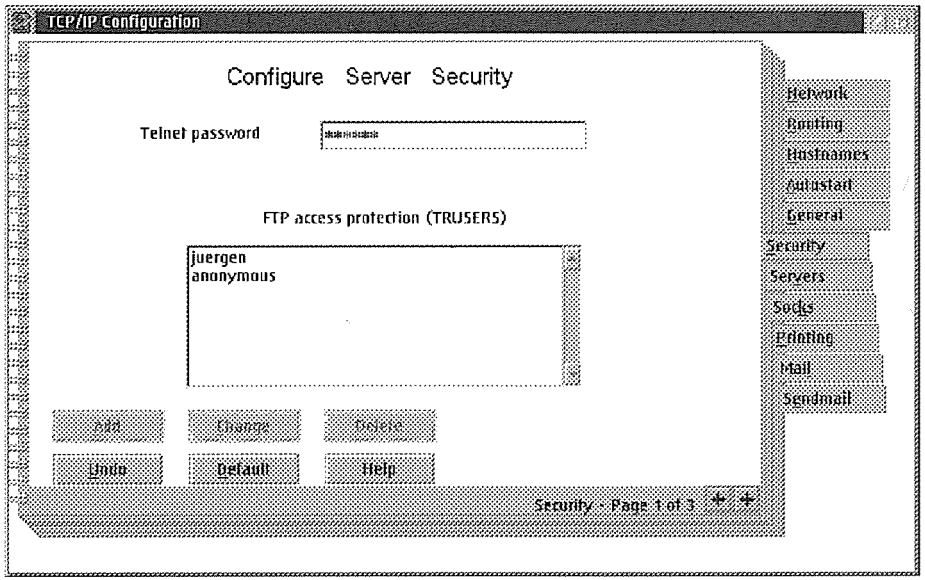


Figure 322. TCP/IP Security Configuration Page 1/3

In addition, you can define the trusted users for the FTPD daemon. This function helps you to manage the TRUSERS file in the ETC directory. This file contains the user IDs, passwords and access rights for the FTP server. To make changes active, the FTPD daemon must be stopped and re-started.

On the second page (see Figure 323) you can define the password that is used to get access to the REXECD daemon. The value will be assigned in the CONFIG.SYS to the PASSWD variable.

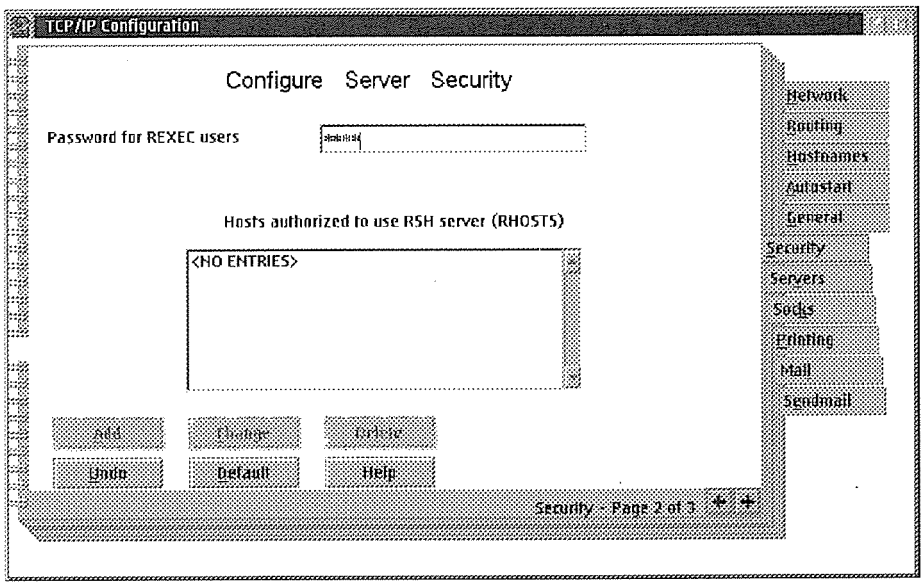


Figure 323. TCP/IP Security Configuration Page 2/3

You can also specify the trusted hosts and users for the RSHD daemon. This function helps you to define and change new entries in the RHOSTS file in the ETC directory.

On the third page (shown in Figure 324) you can define the trusted hosts and their access to specific directories when you are running the TFTPD daemon on your machine. This option helps you to maintain the TFTPAUTH authentication file.

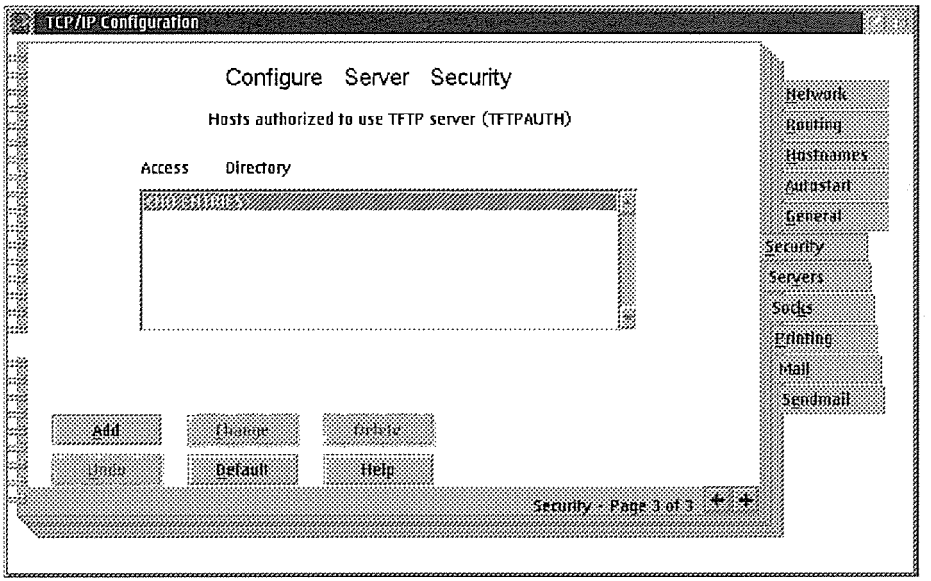


Figure 324. TCP/IP Security Configuration Page 3/3

5.10.7.7 The Servers Configuration Page

The information defined here can also be provided by a DHCP server. The NewsReader/2 server is the default server that will be contacted for newsgroups.

The Gopher server is the host name of the default server that will be contacted first when starting the gopher. The same is true for the World Wide Web server; it specifies the default server that will to be contacted first.

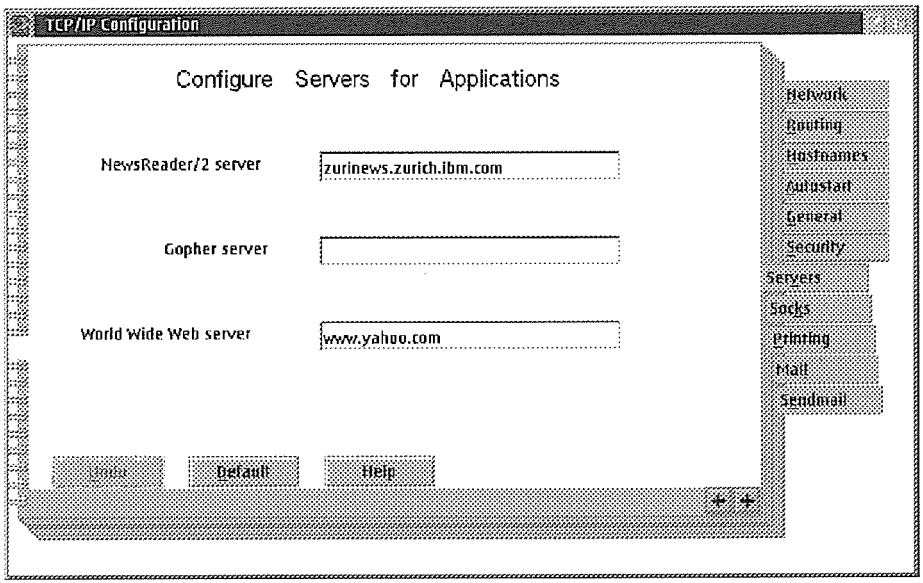


Figure 325. TCP/IP Server Configuration Page

5.10.8 The SOCKS Configuration Pages

Setting up the SOCKS configuration is done easily with the SOCKS configuration pages. With the check box on the first page (see Figure 326) you can enable or disable SOCKS on your host.

The SOCKS Userid field is where you can define your user ID on the SOCKS server. This is optional.

The SOCKS domain field specifies the internal or local domain that will be used by the local name server to resolve names within your protected network.

The SOCKS nameserver is the name server that is used to resolve the external addresses. It is not necessarily the same one that you use in the local TCP/IP network.

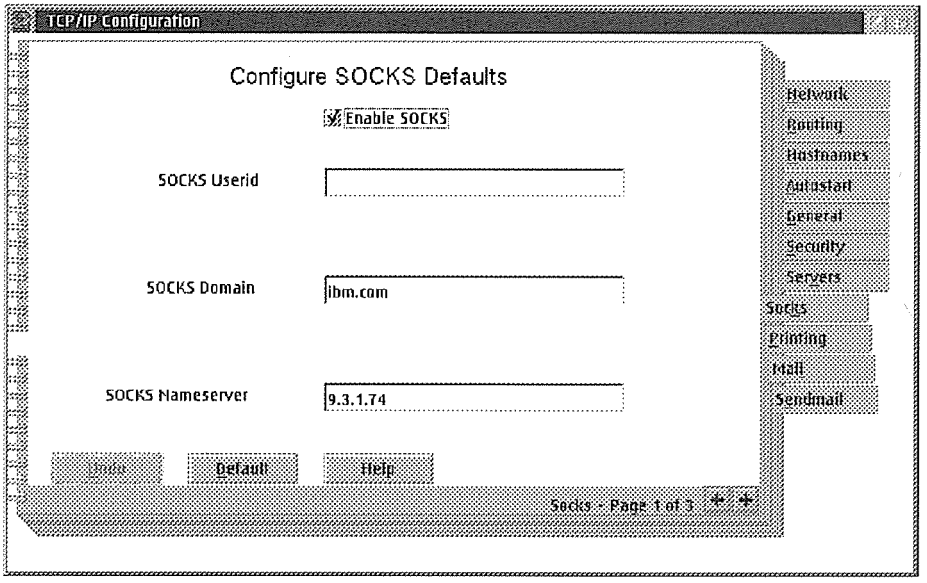


Figure 326. TCP/IP SOCKS Configuration Page 1/3

On the second page you can define those hosts that you have a direct connection to. For performance reasons you may want to specify which networks are reachable without the need for SOCKS support. You can address entire networks.

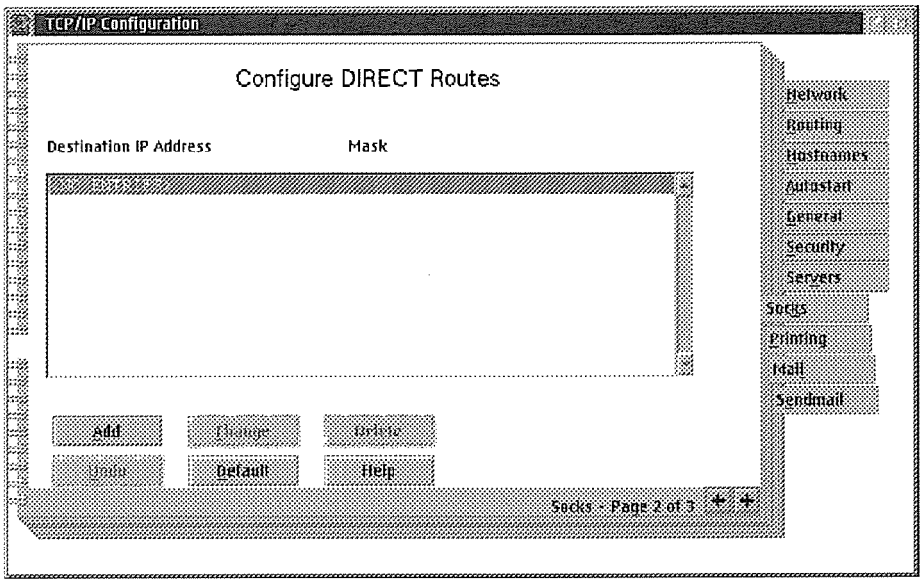


Figure 327. TCP/IP SOCKS Configuration Page 2/3

The third page allows you to define multiple SOCKS servers with actual destination addresses and subnet masks. In the example shown in Figure 328, we have defined the SOCKS server b.SOCKS1.server.ibm.com to be used for *all* addresses. This is indicated by the 0.0.0.0 address.

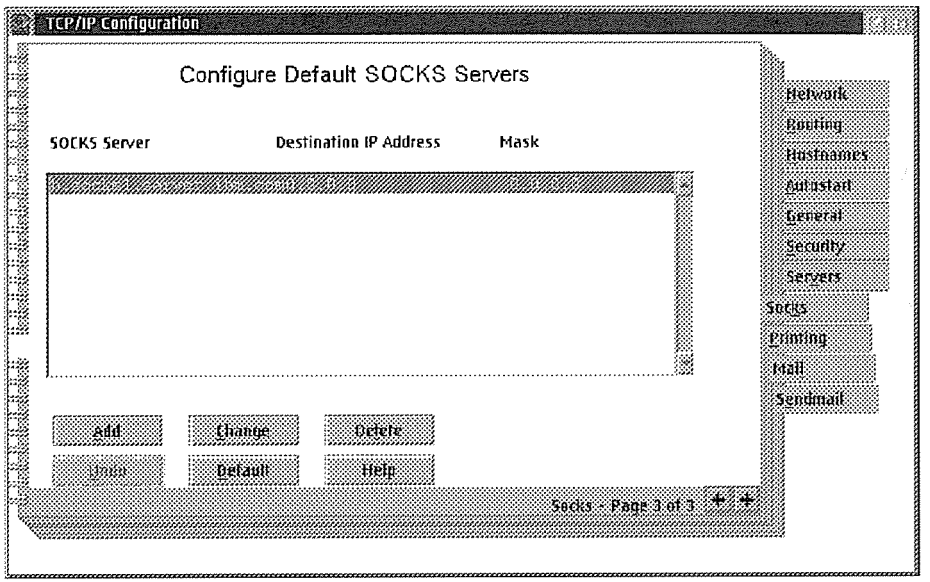


Figure 328. TCP/IP SOCKS Configuration Page 3/3

5.10.8.1 The Printing Page

On the Printing page (shown in Figure 329) you can define the default remote printer server and its printer port. These entry fields will define the environment variables LPR_SERVER and LPR_PRINTER in the CONFIG.SYS file. If these values are not set, you always have to specify them when you want to print on a TCP/IP-connected printer.

The maximum number of lpd ports can only be defined in the TCP/IP configuration notebook. It defines the maximum number of lpd connections that can be defined and used when the lprportd daemon is running.

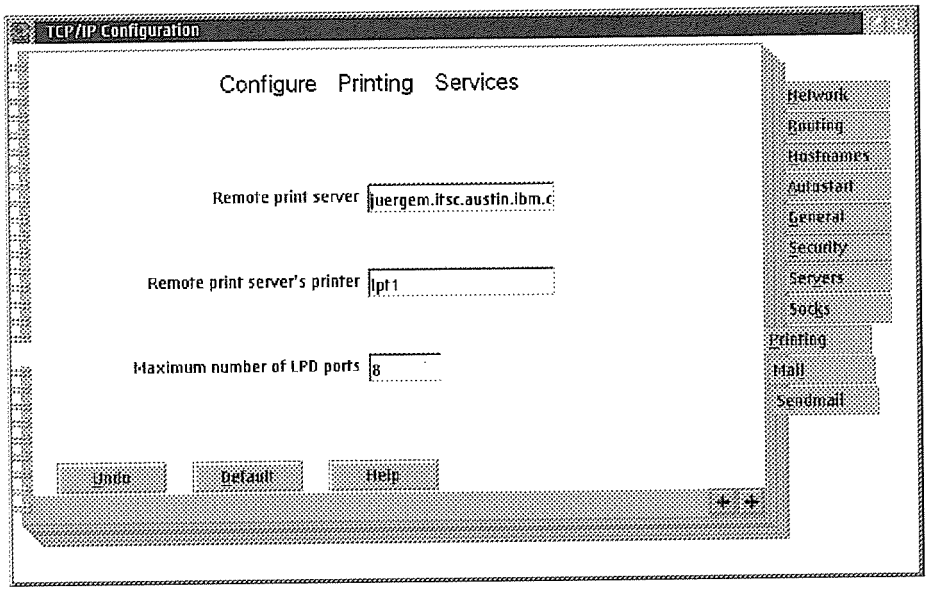


Figure 329. TCP/IP Printer Configuration Page

5.10.8.2 The Mail Configuration Pages

On the Configure Mail for Ultimail or Mailing from NewsReader/2 page, you can specify the environment that the mail clients will use: LAN only, modem connection only, or both.

Click the **Enable multiuser mail for this workstation** to specify if multiple users (or user IDs) are used on this machine. If so, you have the choice to be prompted for the user ID each time you connect to the mail server. To do this, check the **Prompt for mail user ID every time** check box on page 2. Otherwise the specified mail user ID will be used. In addition, you can also define where the default mail storage directory will be.

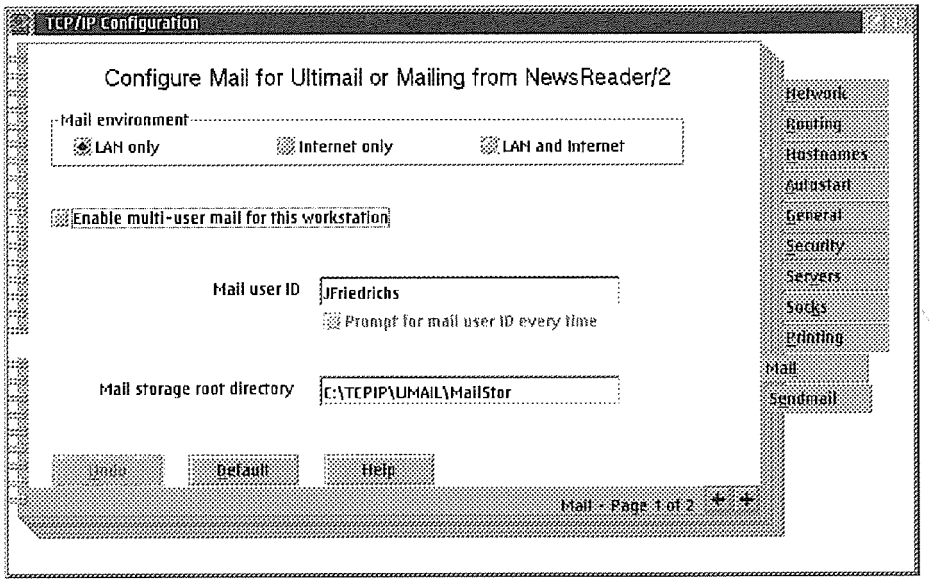


Figure 330. TCP/IP Mail Configuration Page 1/2

On the second page you can select the **Prompt for POP information every time** check box when you have defined multiple users on the previous page. Otherwise you can just type in the POP server itself, your POP user ID and the assigned password. When Ultimail tries to connect to the POP server it will get the information from these fields instead of prompting for them.

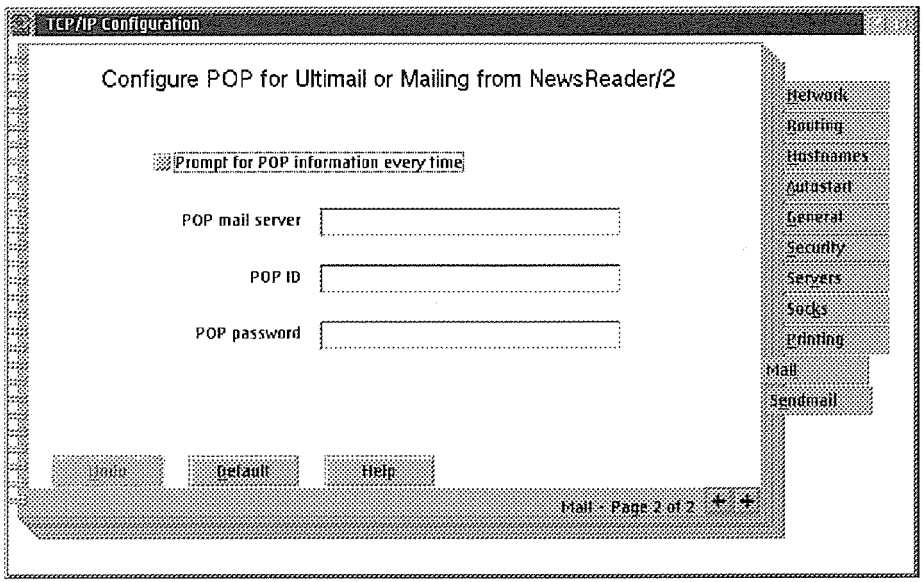


Figure 331. TCP/IP Mail Configuration Page 2/2

5.10.8.3 The Sendmail Configuration Pages

On these pages you can configure the parameters for the sendmail daemon of OS/2 Warp 4. You can select which mailing program you want to use; Ultimail or the NewsReader/2. Both are included in OS/2 Warp 4, or you can use a different mailing program such as the shareware program PMMAIL.

The parameters you change for the Ultimail configuration are stored in the SENDMAIL.UML file. Those for other mailing programs are stored in the SENDMAIL.CF file. As shown in the example, you can configure the mailer program for what you want to use, the directories that are used for the mail to be queued, etc.

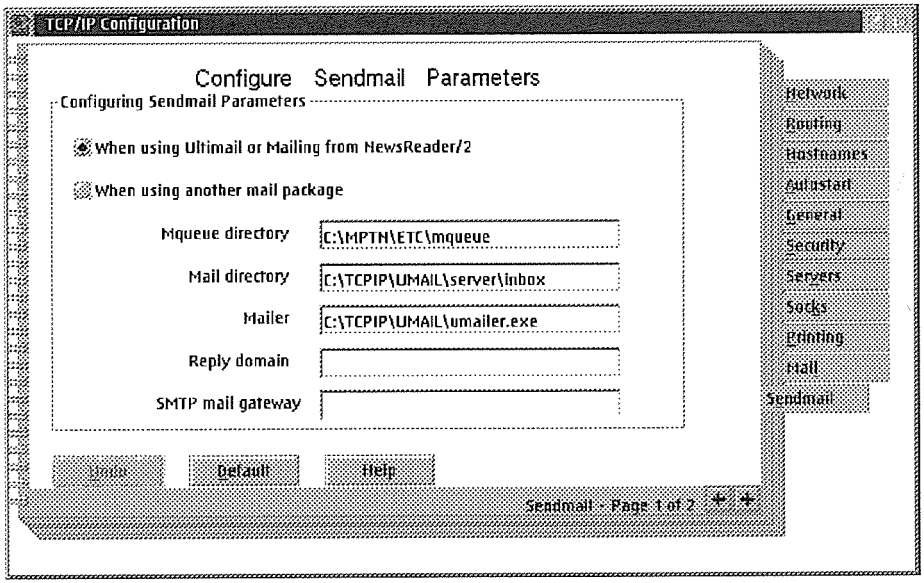


Figure 332. TCP/IP Sendmail Configuration Page 1/2

On the second page you can specify the domain environment for your LAN mail. This settings are stored in the SENDMAIL.UML and SENDMAIL.CF directory.

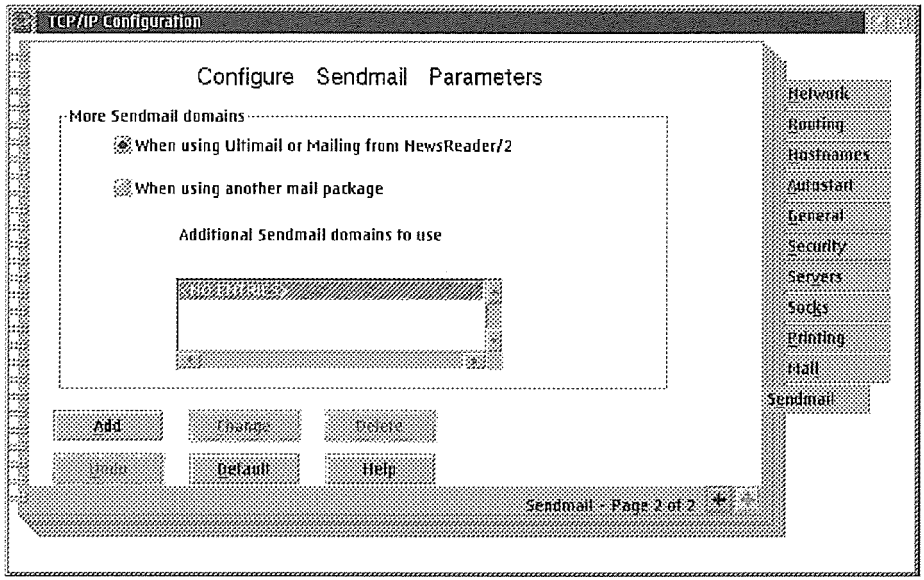


Figure 333. TCP/IP Sendmail Configuration Page 2/2

5.10.9 The INETD Super Server Daemon

The inetd super server daemon has no direct function. When it is started, it looks in the INETD.LST file in the ETC directory to decide, which TCP/IP servers (daemons) have to be started as a part of the inetd system process.

The advantages of starting a daemon as a part of the inetd process are:

- Use of less system resources, because the system overhead is reduced to only one system process.
- The different TCP/IP daemons are not shown in the task list.
- When you shut down the system, you do not have to confirm each TCP/IP daemon separately.

Some of the advantages are that by starting the TCP/IP servers detached, they do not appear in the task list and can therefore not be terminated from the task list.

There are also some disadvantages in using the inetd instead of starting the TCP/IP daemons as their own processes.

- Single TCP/IP daemons cannot be stopped, only the complete inetd including other TCP/IP services must be stopped.

- You cannot specify any parameters to be included with daemons, since parameters are not accepted in the INETD.LST file.

The INETD.LST file should not be edited manually. You should always use the Autostart page in the TCP/IP Configuration notebook to make changes to that file.

5.10.10 The Internet Dialer

OS/2 Warp 4 provides you with two methods to make dial-up connections to the Internet:

- The IBM Internet Dialer

  This utility, located in the Internet (Modem) folder found in the Program folder provides access through the IBM Global Network (IGN).

- The Dial other Providers

  This utility, also located in the Internet (Modem) folder provides access through other providers using the SLIP or PPP protocol.

You must register with an Internet Service Provider (ISP) in order to obtain access to the Internet. You can register with the IBM Global Network (IGN), or you can register via another service provider.

5.10.10.1 Using IGN As Your Internet Service Provider

You can register and connect to the IGN very easily by using the IBM Internet Dialer utility provided with OS/2 Warp 4.

To register with IGN, click on the **Registration** icon located in the IBM Internet Customer Services folder, which resides within the Internet (Modem) folder, or simply start one of the Internet applications for the first time.

The IBM Internet Dialer will automatically prompt you for registration information.

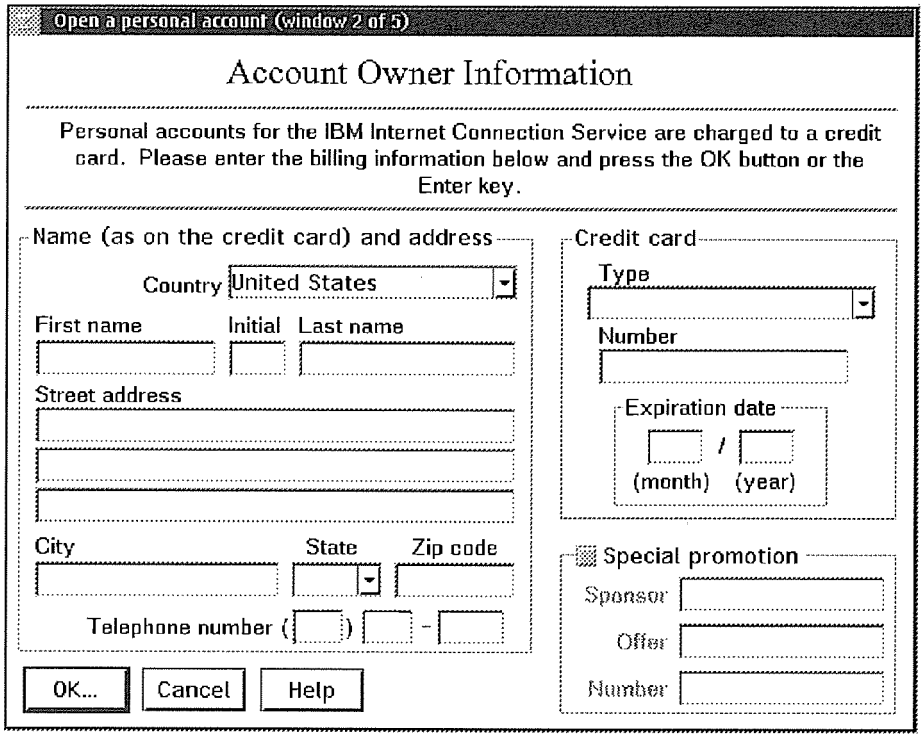


Figure 334. IBM Global Network Account Registration

You will need to have the following information handy before you start to register a personal account:

- Your name, address, and telephone number
- Your credit card number and expiring date
- The make and model of your modem
- The communications port number your modem is connected to
- Any dial prefix you may need to use to get an outside line
- The dial method you are using (pulse or tone)
- A choice of three preferred user IDs

  The registration server will check to see if your first choice is already taken. If so, it will try your second choice, and so on. If all three of your choices are already taken by other users, it will prompt you to enter additional choices.

To carry out the registration, simply double-click on the **IBM Internet Dialer** icon or start any of the Internet applications. The IBM Internet Dialer will detect that you have not previously connected to the Internet, and will prompt you for the information discussed above.

After filling in the appropriate fields you will be presented with the option to send your registration to IGN. Once this is done, all your details are recorded for future use and you can use the IBM Internet Dialer to connect to the Internet. IGN will automatically configure your computer each time you log in, tailoring items such as name servers, mail servers and news servers for you.

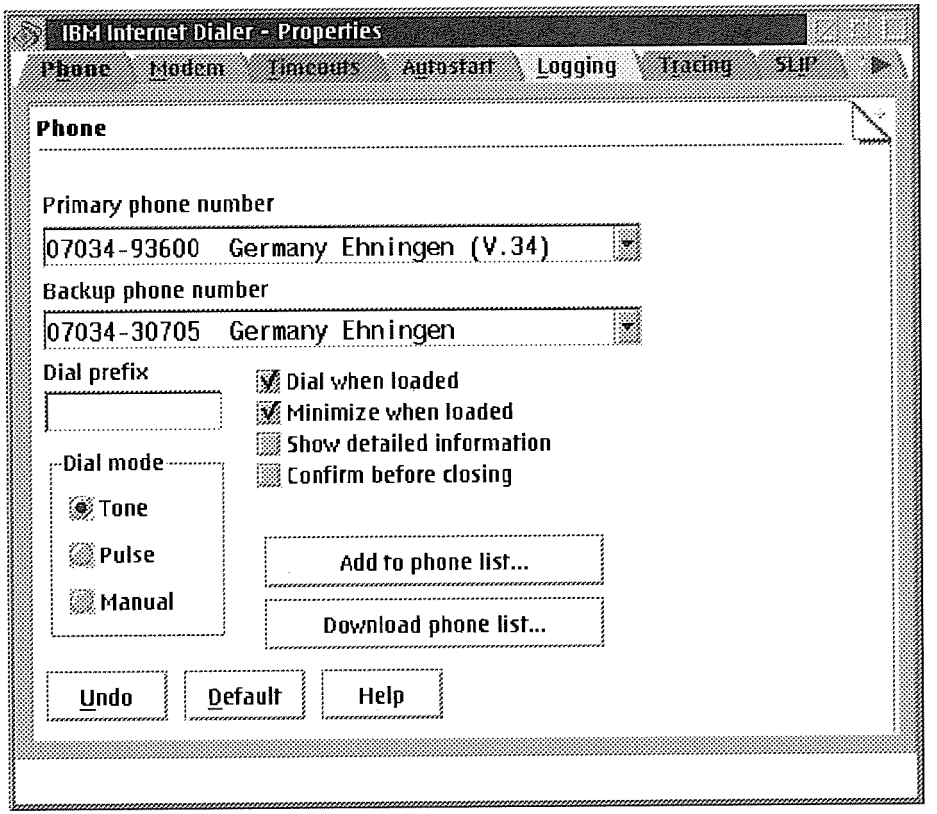


Figure 335. IBM Internet Dialer - Properties

If you experience any problems logging into the IGN or if you would like to see a more detailed view of the login process, open the **Properties** notebook for the IBM Internet Dialer utility, and select **Show Detailed Information** on the first page. The IBM Internet Dialer window will now show detailed information of the login process.

5.10.10.2 Using Another ISP

If you use another service provider you must use the Dial other Providers utility to connect to the provider. This dialer has to be configured before you can use it for a connection. To do so, click on the **Dial other Providers** object in the Internet (Modem)

folder. When the dialer appears (see Figure 336) you can select one of the defined connections and then click on **Dial** to establish a connection, or click on **Add Entry** to add the configuration for a new ISP.

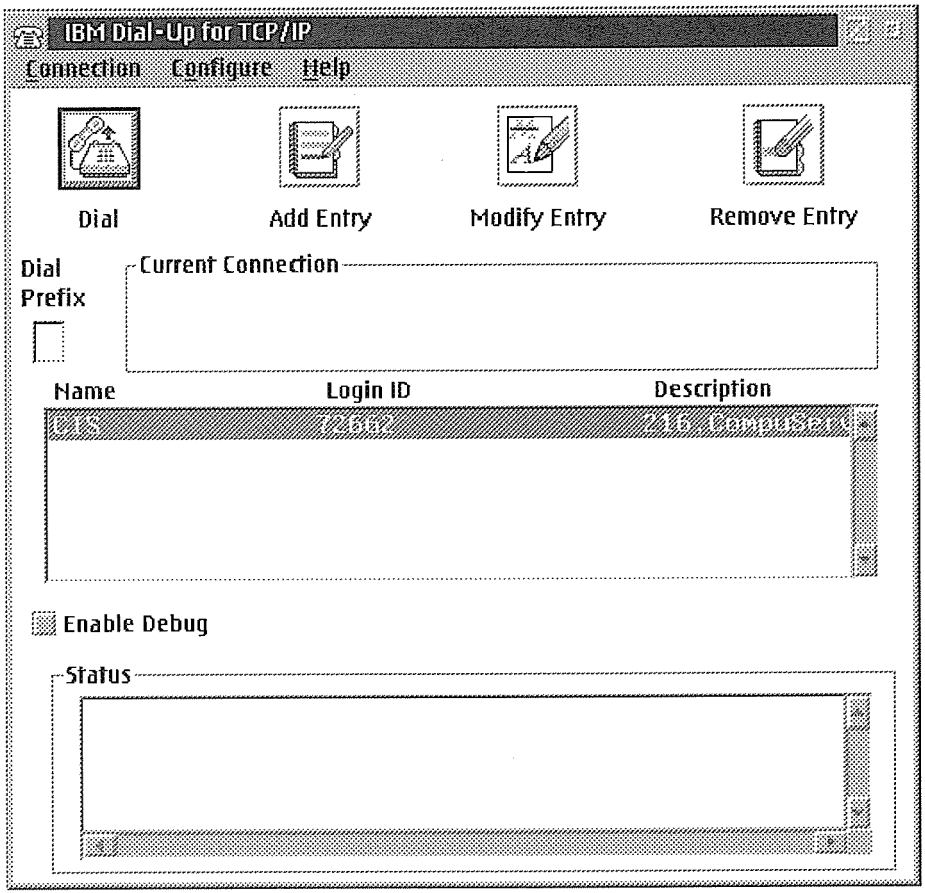


Figure 336. Dial other Providers Utility

You now have to define the configuration parameters in the configuration notebook that applies to your situation as described in the following paragraphs.

Login Info Page: From the Dial other Providers utility window, shown in Figure 336 on page 583, you can also click on **Add Entry** to add the configuration for a new provider, or on the **Modify Entry** icon to modify the parameters for an existing service provider. The Modify Entries page is shown in Figure 337. The Add and Modify Entries pages are essentially the same, except that the Add Entries page contains no information.

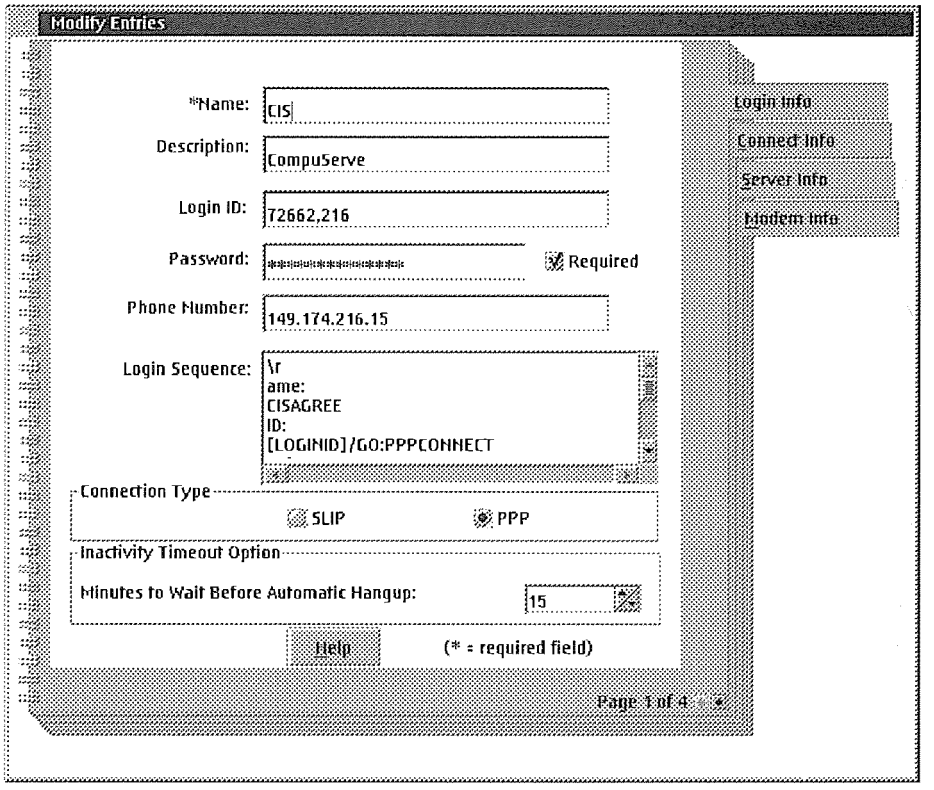


Figure 337. Dial other Providers Utility - Login Information

The first page in the notebook is the Login Info page. On this page you must provide a name for the connection. This is the name that will appear in the list in the main window. You also have to provide information regarding your service provider, including the provider's connection telephone number and your login ID and password if required.

Note that you must obtain all the necessary information from your service provider before you can configure this connection.

Depending on your ISP, you must select either the SLIP or PPP protocol in the Connection Type group of radio buttons. In general, PPP is a better protocol than SLIP and most service providers today support PPP.

In the Login Sequence entry fields you will specify the login sequence or filename of the login script to be used. A login sequence can be defined in three different ways:

- Typed in
- A simple response files (for example, RSAS.RSP)

- An executable file (for example ANNEX.CMD)

The login sequence is written as a series of "send-expect" verbs that have to be sent to the host one after the other. This type of login sequence can be typed directly into the entry field instead of specifying it as a separate file.

An example of a login sequence to obtain Internet access with CompuServe as the provider follows:

```
\r                          1 send
Name:                        2 wait for
CIS                         3 send
ID:                         4 wait for
[LOGINID]/GO:PPPCONNECT     5 send
Word:                        6 wait for
[PASSWORD]                  7 send
PPP                         8 wait for
```

Figure 338. Login Script for CompuServe

Line 1 sends a newline to get a reaction from the remote host. In line 2 the script is waiting for the last four characters from the "Hostname:" prompt. When it has recognized this prompt, it sends CIS (3) to let the remote host know that you want to access CompuServe itself. The dialer now waits for the last 3 characters of the "UserID:" prompt (4). When this prompt is recognized, it sends out the password (5), specified in the password field on the same page, followed by the command, that tells CompuServe to go to an PPP Connection and so on.

The keyword between the square brackets ("[" and "]"), in this example [LOGINID] and [PASSWORD] are substituted with the values you have entered in this configuration panel.

An example of such a response file is RSAS.RSP in the \MPTN\ETC directory.

Another way to define a Login Sequence is to put the name of an executable file in the Login Sequence field.

There are a number of sample REXX files in the \TCPIP\BIN directory. ANNEX.CMD is an example of a REXX automated login script which, with a certain amount of REXX knowledge, will allow you to connect to Internet service providers.

The ANNEX.CMD script is designed for logging in to a Xylogics Annex terminal server, but can be adapted to allow connection to other servers as well. For example, you might enter the following on the Login Info page of the Add Entries notebook:

```
Login Script: annex.cmd atdt999-9999 loginid password
```

While ANNEX.CMD supports the use of the asterisk (*) character in order to prompt for a password, this will not work using the Dial other Providers utility. You must therefore specify your password. This can be done by putting the password in readable letters directly behind the ANNEX statement or by using the [PASSWORD] command instead of the password, which will be substituted by the entry you have put in the Password setting.

To adapt the AMNNEX.CMD for your provider, you may need to remove whole sections of code, modify sections, and perhaps hard code the IFCONFIG and ROUTE commands. Refer to a TCP/IP command reference manual for information regarding these commands.

Connect Info Page: You have to specify IP addresses for your computer as well as for your service provider's server. You do this by using the Connect Info page in the Modify Entries notebook, as shown in Figure 339. If your provider is using dynamic IP addressing as described in 5.10.1.3, "PPP" on page 540 you get configuration information (such as your IP address, the subnetmask and the default router) dynamically when the connection is established.

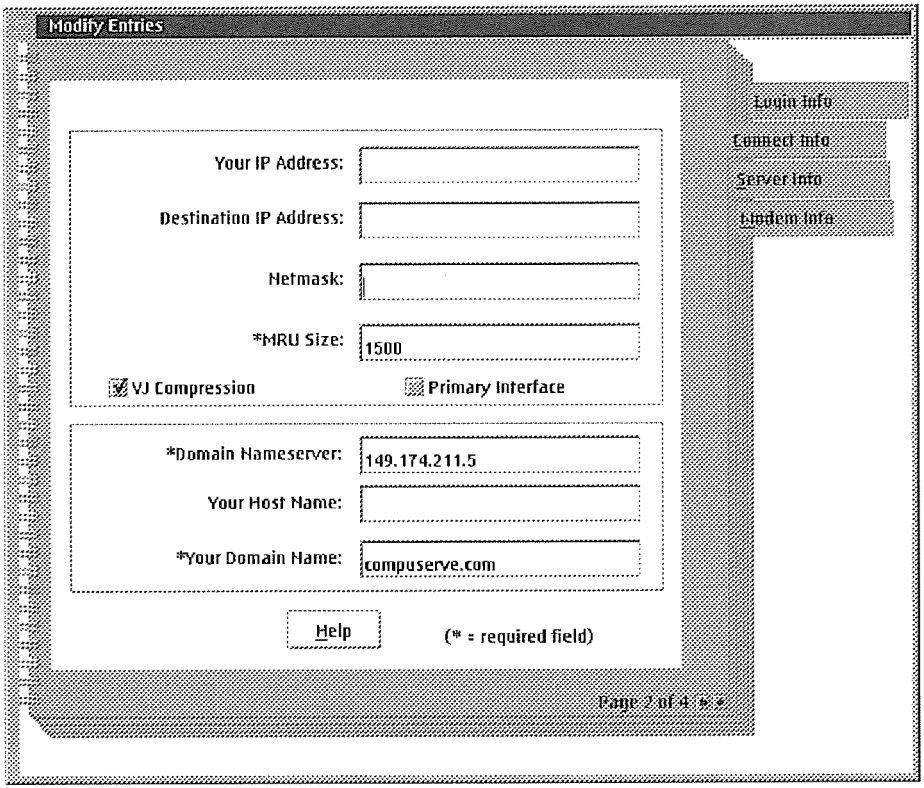


Figure 339. Network Dialer Utility - Connection Information

This information should be provided to you by your service provider, along with the address of your domain name server, your host name and the name of your service provider's domain.

Server Info Page: The domain name server on the prior page is used to resolve Internet names. This is a required field. The servers defined on the Server Info page in the Modify Entries notebook, as shown in Figure 340, are not so important for the base Internet functionality, but they are required for some of the Internet utilities provided with OS/2 Warp 4.

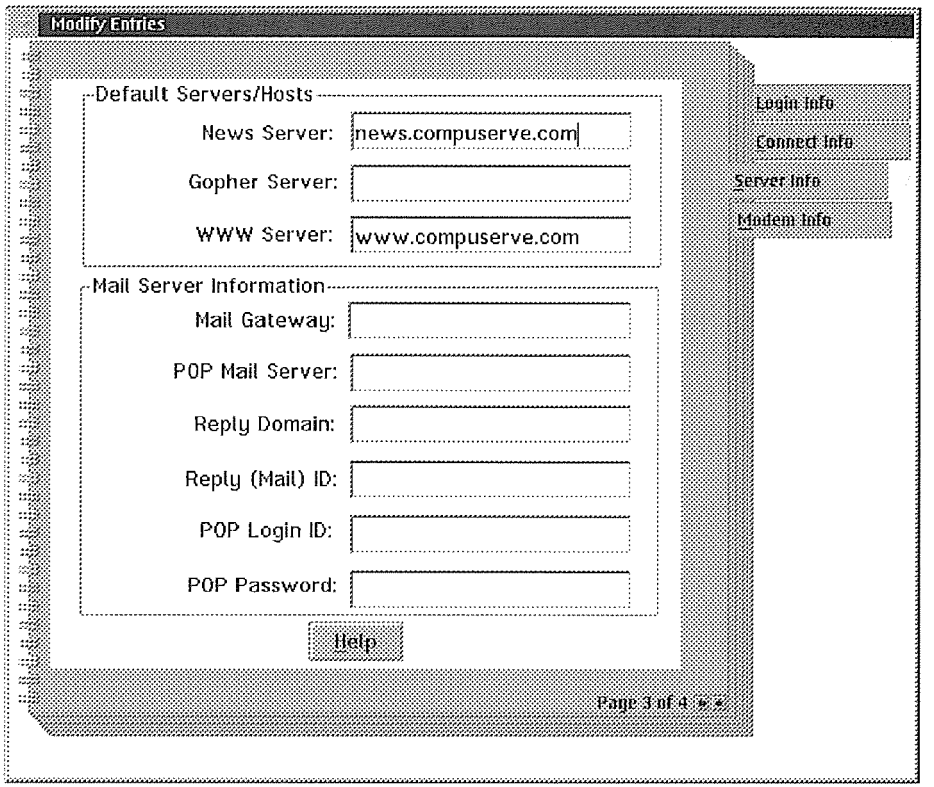


Figure 340. Network Dialer Utility - Server Information

This page allows you to specify default servers for newsgroups, Gopher and World Wide Web sites, and electronic mail. These servers should be provided to you by your Internet service provider. Enter their names in the appropriate fields on the Server Info page. Depending on your Internet service provider, you may receive this information when your connection is established.

Modem Info Page: Finally, you must enter information regarding your modem on the Modem Info page as shown in Figure 341.

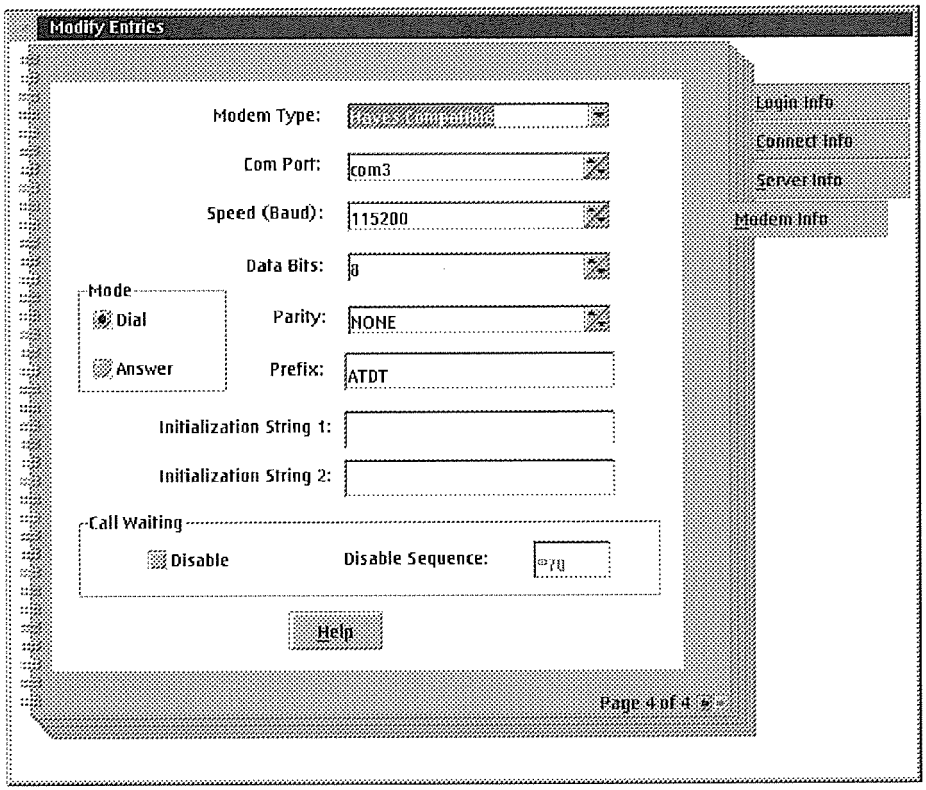


Figure 341. Network Dialer Utility - Modem Information

Select the type of modem attached to your computer from the Modem Type list. If your modem is not listed, try selecting **Hayes Compatible**, since many modems support the Hayes command set.

Select the communication port to which your modem is attached (for example, COM1:) from the Com Port field, and the transmission speed, data bits and parity settings. You should obtain these settings from your service provider. In most cases you have to set the settings to 8 Data Bits and no parity.

Use the ATDT prefix if your telephone system uses tone dialing. If you use pulse dialing, use ATDP instead.

Lastly, you need to specify any necessary setup strings for your modem. These strings are passed to the modem, and act as commands to set the modem into the required mode for dialing. In most cases you can accept the defaults provided.

After the configuration is completed and you have closed the configuration notebook for the dialer, connect to the ISP by clicking on the **Dial** button. To check if the connection has been established successfully, you can start any TCP/IP application, ping the router or use the IFCONFIG command to display connection information. The IFCONFIG command syntax is `ifconfig sl0` for a SLIP connection and/or `ifconfig ppp0` for a PPP connection.

If a connection is established successfully, this command displays the IP address that has been defined for this interface.

5.10.11 Accessing the Internet Using SOCKS

A SOCKS server is usually a kind of firewall server. It runs sockd and has one network adapter interfacing with a secure network and another interfacing with a public network such as the Internet.

The sockd service allows the flow of information when it receives a request from the internal network but blocks it when it receives requests from the public or external network. This behavior can be defined, and an external host can, for example, call the sockd daemon and identify itself with a user ID and password. Its request will then be passed into the protected network.

Client code that is aware of SOCKS servers, commonly referred to as "SOCKSified or SOCKS aware" clients, will contact the SOCKS gateway and request a session to be established with a remote host. This session is directly between the SOCKS gateway and the remote host, but all data from the remote host is passed back to the client, so it appears to the client that the session is between the machine and the remote host.

Using SOCKS has the advantage that no application code runs on the firewall, reducing security risks and resource utilization. All applications using TCP (in contrast to UDP) are supported. The disadvantage is that clients have to be SOCKSified. Fortunately, most of the clients in OS/2 Warp 4, such as the WebExplorer, Telnet, and FTP, are already SOCKSified.

In the traditional UNIX version of SOCKS, there is a concept called *Versatile clients*. When you SOCKSify a program, you replace the networking calls (connect, listen, etc.) with versions that first talk or listen to a SOCKS server. It then uses the protocol to send requests out. Versatile clients have networking calls that are intelligent enough to say "I'm connecting to an address that is internal; therefore, do not connect me to the SOCKS server, connect me directly to the requested host." This intelligence is defined in a file that differentiates between internal or direct and external or indirect.

If you are using OS/2 Warp 4 on a computer that is sometimes connected to the Internet via LAN and sometimes connected via dial up, you must take careful consideration of your SOCKS setup. With SOCKS enabled, the clients will always try to connect to the SOCKS server first instead of going directly to the requested host. Therefore, if you are connected to the Internet via a LAN, make sure SOCKS is enabled and when you dial

in, disable SOCKS. This can be done in the TCP/IP Configuration notebook, described in 5.10.11.1, "Configuring SOCKS" or in the SOCKS.ENV file that is in the \MPTN\ETC directory.

5.10.11.1 Configuring SOCKS

The SOCKS setup is done easily in the SOCKS configuration pages in the TCP/IP Configuration notebook. With the check box on the first page (see Figure 342 on page 591) you can enable and disable the clients to use SOCKS. You have to disable SOCKS if you use a modem connection to an Internet service provider.

The SOCKS Userid field is an optional field in which you can define a virtual user ID for your PC. It is used for some SOCKS servers that implement a security crosschecks mechanism to check if the IP address of the requester of a SOCKS session is really logged on to the requesting host.

The SOCKS Domain field specifies the SOCKS domain name or internal domain name that will be used by the local name server to resolve names within your protected network.

The SOCKS Nameserver field is the name server that is used to resolve IP addresses. It does not necessarily have to be the same server that you use in your local TCP/IP network, since this one might know only the host names in the local IP network.

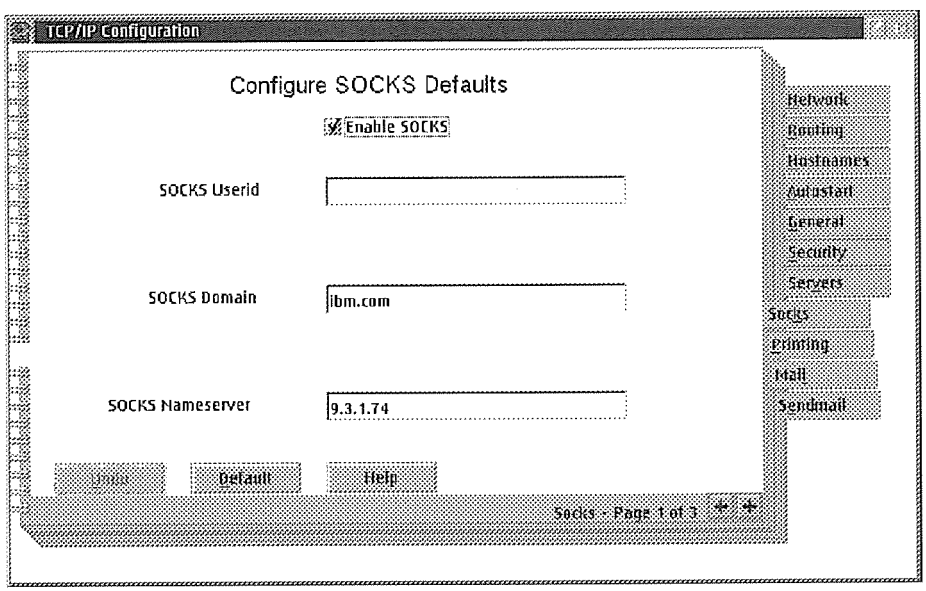


Figure 342. TCP/IP SOCKS Configuration Page 1/3

On the second page you can define those hosts that you want to have a direct connection to instead of using the SOCKS server. This is very useful because the performance when accessing a remote machine in the same LAN slows down dramatically if you go first through a SOCKS server. You can address entire networks.

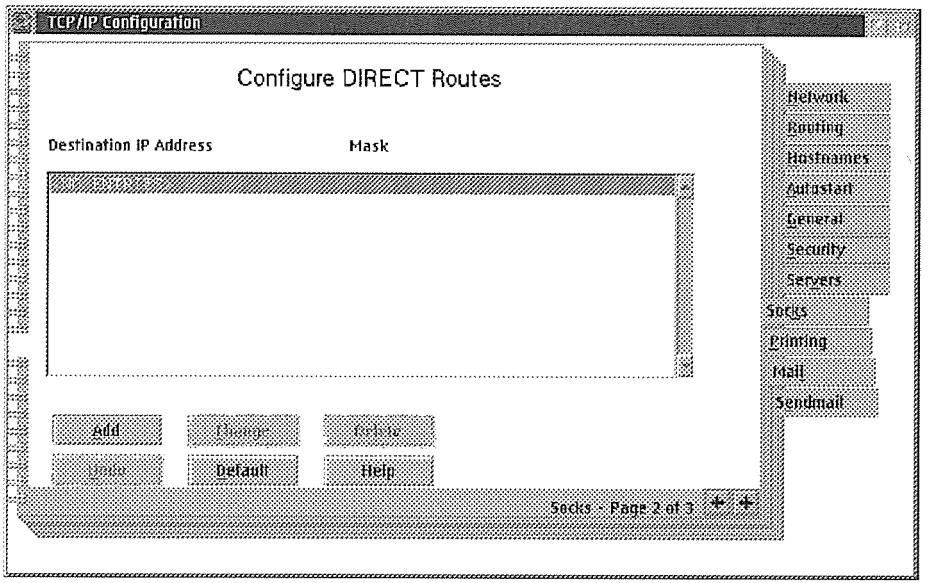


Figure 343. TCP/IP SOCKS Configuration Page 2/3

The third page allows you to define multiple SOCKS servers and to specify the rules when they have to be used. In the example shown in Figure 344, we have defined the SOCKS server as b.SOCKS1.server.ibm.com to be used for all addresses. This is indicated by the 0.0.0.0 address.

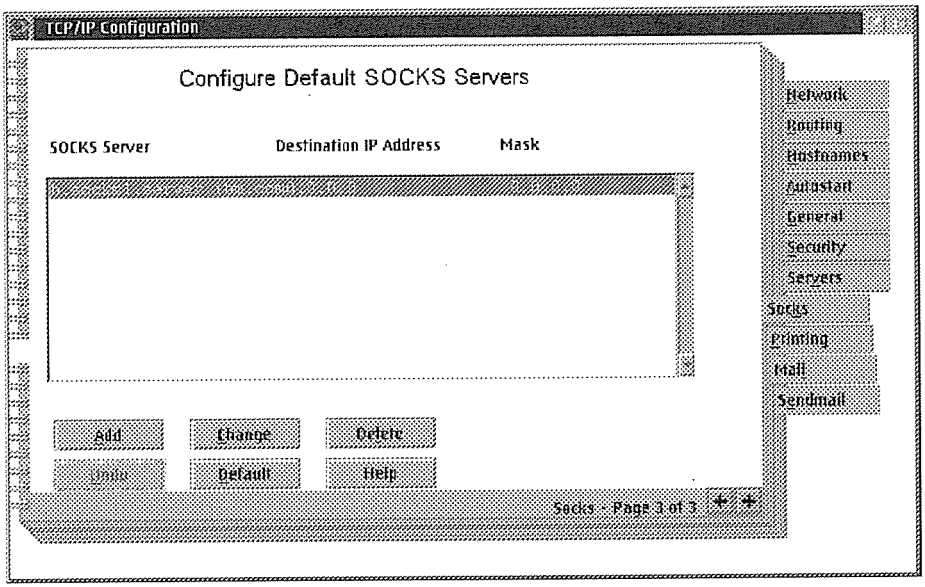


Figure 344. TCP/IP SOCKS Configuration Page 3/3

The SOCKS configuration is stored in the SOCKS.CFG and SOCKS.ENV configuration files in the \MPTN\ETC directory. The configuration becomes active immediately for all clients. No reboot is required.

5.10.12 Transferring Files with FTP

Many sites on the Internet offer the capability of directly accessing certain areas of their remote host for uploading and downloading of files. Such sites are known as FTP sites since they use the TCP/IP File Transfer Protocol (FTP) utility.

The most frequently used sites are known as *anonymous FTP sites.* These sites are open to everybody, and anyone can download files from there. You connect to these sites with the user ID *anonymous* and use your e-mail address as the password (if a password is required at all). Other sites use user ID/password pairs, and sometimes account information, to enforce security and prevent unauthorized users from accessing information stored there.

OS/2 Warp 4 includes both the server and client code needed to set up an FTP server. You can send and receive files with your OS/2 Warp 4 system using FTP and you can set up your system as an FTP server, so that others can have access to certain file areas of your system.

In fact, OS/2 Warp 4 includes three different types of FTP client software. Each of these does exactly the same thing, and the only difference is the way in which you access them. The three clients are:

- The FTP Folder object integrated in the Workplace Shell
- The graphical FTP-PM client
- The command line FTP client

Additional, you can use the WebExplorer as FTP client software as well. The WebExplorer is capable of accessing FTP servers and downloading files to your OS/2 Warp 4 system. See 5.10.27, "The WebExplorer" on page 654 for a detailed discussion of the WebExplorer.

5.10.12.1 Using FTP Folders

The easiest way to transfer files using FTP is to use the FTP folder object that is part of the OS/2 Warp 4 Workplace Shell. Using this method of transfer, each connection to an FTP server looks and behaves very similar to a normal folder on your desktop, with some additional FTP client functionality. An FTP folder is shown in Figure 345 on page 594.

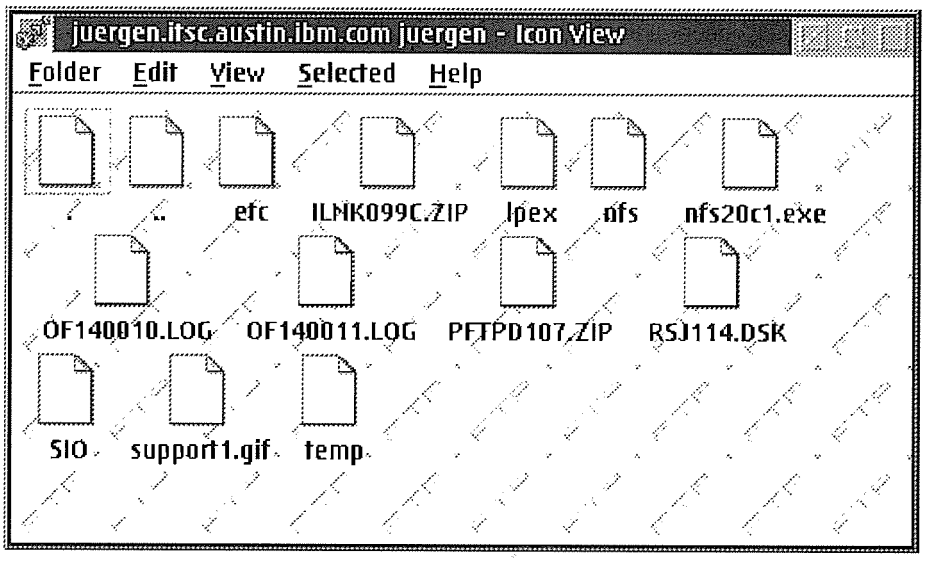


Figure 345. FTP Folder

To create an FTP folder and establish a connection to an FTP server, you must first create the FTP client folder. To do this, just drag a FTP Folder object from the Templates for Internet folder to your desktop. The Properties notebook will automatically

open, and you must then fill in the necessary information about the server to which you want to connect.

On the Host page of the configuration notebook, you have to specify the host name (or the IP address) of the target host that this FTP object has to connect to.

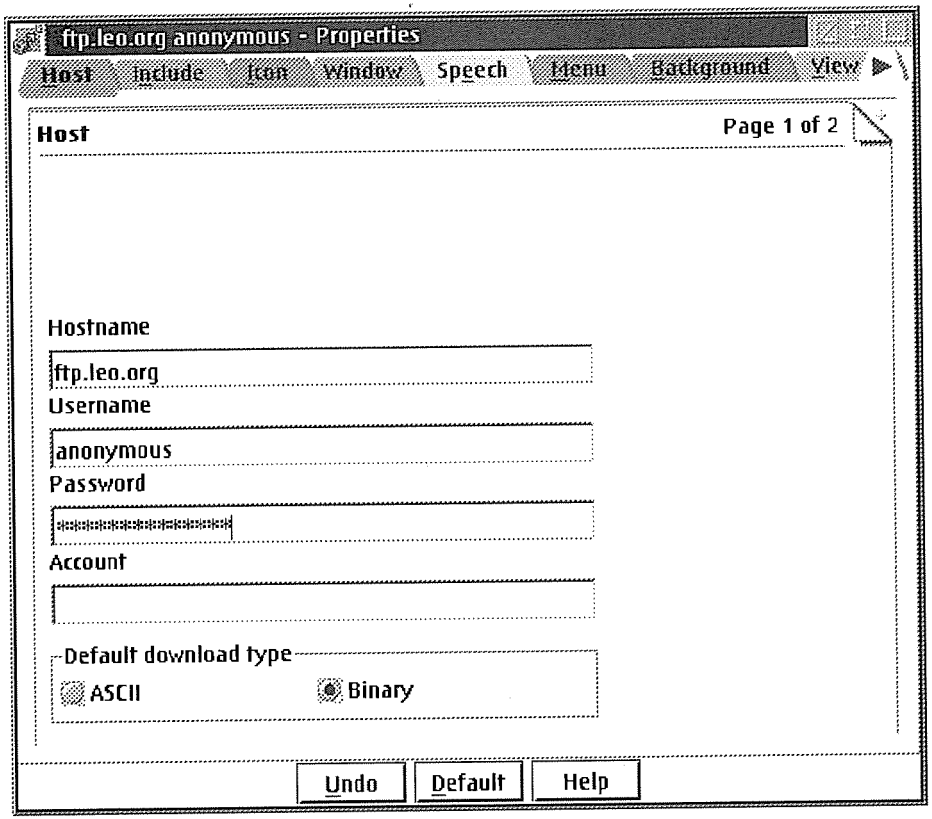


Figure 346. Configuring the Workplace Shell FTP Client - Page 1/2

In the Username entry field you must specify the user name - if you have one - or the generic anonymous user ID with your e-mail address as your password. In the Default download type group you can select the default type that will be used for downloading files. You can choose either ASCII or Binary.

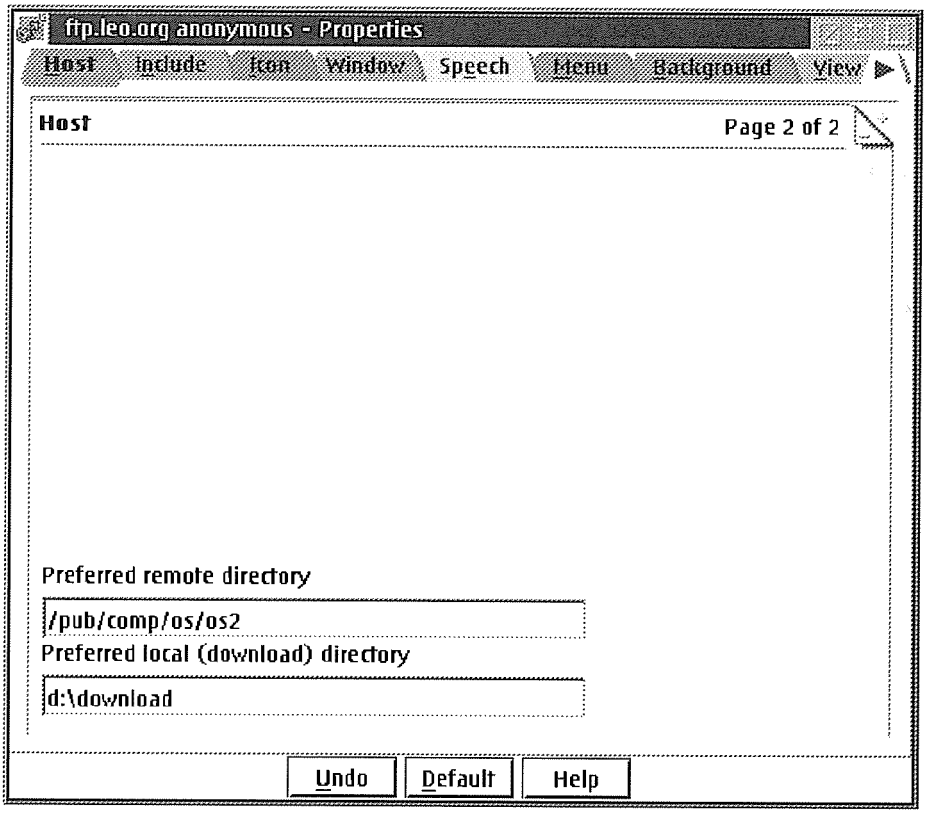


Figure 347. Configuring the Workplace Shell FTP Client - Page 2/2

On the second page (see Figure 347 on page 596) you can specify the default directories on the local host and remote host. If for example, on the host ftp.leo.org the directory you are always downloading from is /pub/comp/os/os2/ and you normally want to download to the local D:\DOWNLOAD directory, you can specify those exact values in the Preferred remote directory and Preferred local (download) directory entry fields.

When you have filled in the necessary fields, close the Properties notebook. To access the FTP server, open the FTP folder, and OS/2 Warp 4 will automatically connect you to the server and log you on.

To receive a file from the server, simply drag the file's object from the FTP folder to wherever you want to store it on your OS/2 Warp 4 system. Be aware that there are two modes of data transfer in the FTP protocol (Binary or ASCII). Text files should be transferred in ASCII mode, while programs, images, etc. must be transferred by using binary mode. Check the mode you are using. You can change the mode by opening

the context menu of the FTP folder and selecting **Set ASCII** when you are in binary mode or **Set Binary** when you are in ASCII mode.

You can also use drag and drop to upload files to an FTP server. Drag the file's icon from wherever it resides on your OS/2 Warp 4 system, and drop it on the FTP folder for the server. Provided you have permission to upload files to the server, the transfer will occur automatically.

You can select multiple files for file transfer. To upload or download a subdirectory, you must open the subdirectory and then select the files to upload or download.

There are several explanations why you may be unsuccessful in establishing a connection to an FTP server. The remote FTP server may not be up and running, or you may have specified a wrong FTP server address. In this case you get an error message as shown in Figure 348 on page 597.

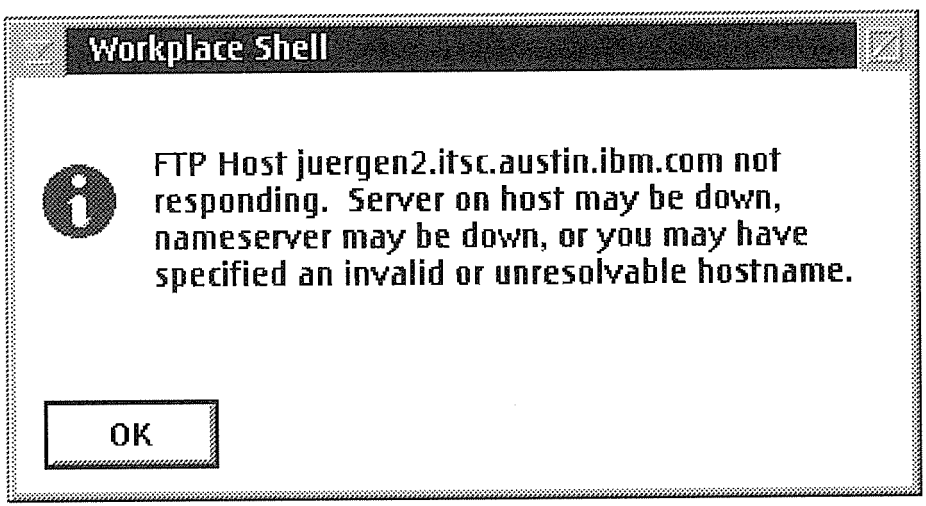


Figure 348. Workplace Shell FTP Error Message. This message appears when the FTP server cannot be reached.

Another reason for not being able to connect to an FTP server could be that the specified user ID is not valid. In this case you get an error message like the one shown in Figure 349.

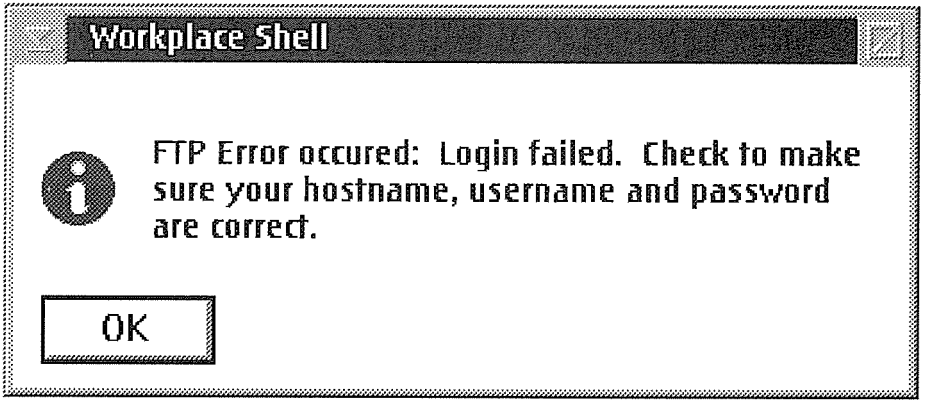


Figure 349. Workplace Shell FTP Error Message. This message appears when using an invalid user ID/password combination.

The best way to resolve such a problems is to start the command line FTP client, as this will provide you with additional information.

5.10.12.2 FTP-PM

The FTP-PM utility allows you to perform FTP file transfers using a Presentation Manager interface. It provides an easy way to locate and transfer files to and from remote hosts and is much easier to use than the command line FTP client, as there is no need to remember a set of cryptic commands. It also provides an alternative to the use of FTP folders in situations where you want to minimize memory usage.

Once it has been configured correctly you need to click on an FTP-PM object on your desktop, and you will automatically be logged on to a predefined FTP server in a predefined directory. The following section explains how to configure FTP-PM.

There are two different ways to connect to a remote FTP server host with FTP-PM:

- Start the FTP-PM client from the Internet (LAN) or Internet (Modem) folder. You must enter the name of the remote host you want to connect to, as well as your user ID and password. For public-access FTP sites, simply use *anonymous* as your user ID, and your e-mail address as your password.
- Drag a new FTP-PM object from the Templates for the Internet folder in the general Templates folder. The Properties notebook will open automatically, allowing you to define all options required for this object. The most important setting is the host name, but you can also define a user ID and password. This prevents you from being prompted for a user ID and password each time you want to connect.

  However, the user ID can be easily accessed by other people using your OS/2 Warp 4 system.

You can use FTP-PM to connect to multiple remote hosts, by starting FTP-PM more than once. If you are in danger of running out of memory, you can use one FTP-PM client to connect to multiple hosts, using the Open Remote Host option in the Connection pull-down menu. This allows you to have multiple hosts open at the same time, swapping between them to transfer files back and forth. However, you cannot predefine the host names and logon parameters for multiple hosts in a single instance of FTP-PM.

For transferring files, the FTP-PM utility provides a menu-driven representation of files and directories on your own computer as well as the remote host, as shown in Figure 350 on page 599.

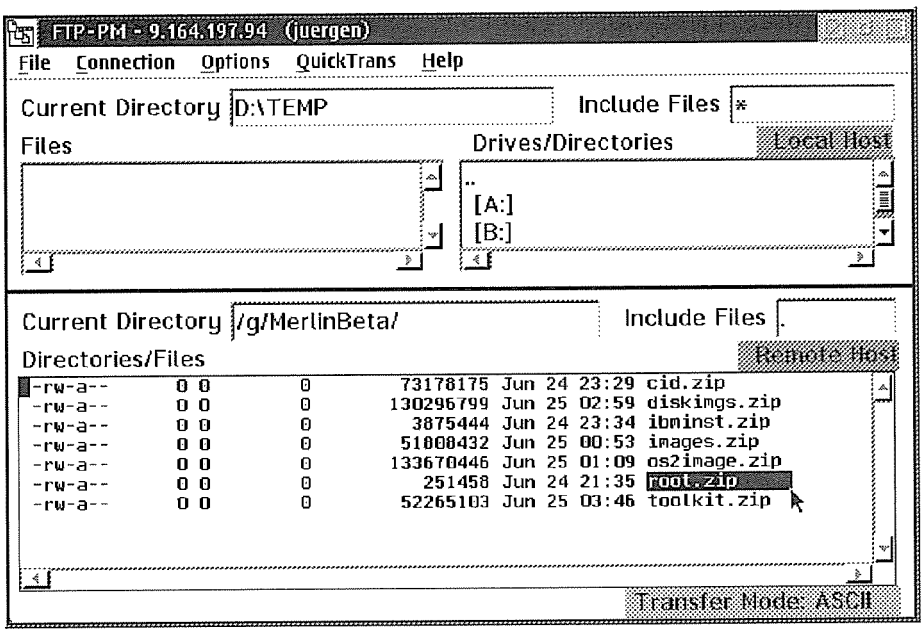


Figure 350. FTP-PM Application Window

You can navigate between directories on your own computer and on the remote FTP site using your mouse, and you can select multiple files for transfer. If you want to up- or download one or more files you can do this by dragging the marked files from the source-host to the target-host or selecting **QuickTrans** from the pull-down menu.

You can also switch between different remote hosts by clicking on the **Open Remote Host** option in the Connection pull-down menu. This allows you to have multiple hosts open at the same time, swapping between them to transfer files back and forth.

5.10.12.3 The Command Line FTP Client

The command line FTP client is the most rudimentary of the FTP clients included in OS/2 Warp 4 and provides a very simple text-based interface. Its primary advantage is that experienced users can gain very fast access to the files they want.

Another advantage of the command line FTP client is that you can use it without any graphical interface. This is useful if, for example, you are logged on to another system using Telnet, and want to perform an FTP file transfer to or from that system. Since Telnet provides only a text-based command line interface, you cannot use FTP-PM or FTP folders, but you can use the command line FTP client.

```
[C:\]ftp 9.164.197.94
IBM TCP/IP for OS/2 - FTP Client ver ₂2:15:36 on May 20 1996 Connected to 9.
164.197.94.
220 STARTREK FTP server (IBM OS/2 Penguin's ftpdaemon V1.8) ready.
Name (9.164.197.94): juergen
331 Password required for juergen.
Password: ......
230-
230-Penguin's ftpdaemon v1.8
230-
230-Hello User juergen,
230-
230-you are in no directory at the moment.  From this virtual
230-directory, you can select any drive on STARTREK that you want to access.
230-If you want to upload a file, please use the public upload
230-directory called /z/upload.
230-
230 User juergen logged in.
ftp> cd /g
250 CWO command successful.
ftp> dir
200 PORT command successful.
150 Opening ASCII mode data connection
drw----      0 0        0               0 Jul 17 16:47 589MBfrei
drw----      0 0        0               0 Jul 17 14:20 BETAS
drw----      0 0        0               0 Jul 17 14:00 MerlinBeta
-rw-ahs      0 0        0             350 Jun 13 07:04 WP ROOT. SF
226 Transfer complete.
263 bytes received in 0.00 seconds (0 Kbytes/s)
ftp> cd MerlinBeta
250 CWD command successful.
ftp> dir
200 PORT command successful.
150 Opening ASCII mode data connection
-rw-a--      0 0        0        73178175 Jun 24 ₂3:29 cid.zip
-rw-a--      0 0        0       130296799 Jun 25 02:59 diskimgs.zip
-rw-a--      0 0        0         3875444 Jun 24 ₂3:34 ibminst.zip
-rw-a--      0 0        0        51808432 Jun 25 00:53 images.zip
-rw-a--      0 0        0       133670446 Jun 25 01:09 os2image.zip
-rw-a--      0 0        0          251458 Jun 24 ₂1:35 root.zip
-rw-a--      0 0        0        52265103 Jun 25 03:46 toolkit.zip
226 Transfer complete.
470 bytes received in 0.00 seconds (0 Kbytes/s)
ftp> bin
200 Type I set.
ftp> get root.zip
200 PORT command successful.
150 Opening BINARY mode data connection
Received 251120 bytes
226 Transfer complete.
local: root.zip remote: root.zip
251458 bytes received in 12.53 seconds (19 Kbytes/s)
ftp> bye
221 Goodbye.

[C:\]
```

Figure 351. Command Line FTP Session

An example of a command line FTP session is shown in Figure 351 on page 601.

Another advantage of this client is that, if you are familiar with FTP commands in OS/2 Warp 4, allows you to handle FTP transfers on almost any other computer system, since these commands are common across almost all FTP client implementations.

The following are the most important FTP commands:

Command	Description
help	Displays all commands with a short explanation.
open	Creates a new connection to a server. A host name or IP address must be specified.
close	Closes a connection to the connected server, but stays in the FTP client.
user	Login as a specified user.
bye	Closes the connection and quits the ftp client.
pwd	Print Working Directory. Shows which directory of the remote. host you are in.
cd	Change Directory on the remote host.
lcd	Local Change Directory changes the directory on the local machine. If no new directory is specified, it only displays the current local directory.
cdup	Changes one directory up on the remote host. On most hosts you can also use cd ...
bin	Changes to binary transfer mode.
ascii	Changes to ASCII transfer mode. If the remote host does not use ASCII, an automatic conversion to ASCII occurs.
put <local-file> [<remote-file>]	Sends the local file to the remote host. If a remote filename is specified, it is uploaded as this file.
get <remote-file> [<local-file>]	Receives the remote file on your local host. If a local filename is specified, it is downloaded with this filename.
mput	Same as put, but allows you to use wildcards to upload multiple files. By default, you will be prompted for every file.
mget	Same as get, but allows you to use wildcards to download multiple files. By default, you will be prompted for every file.
prompt	Toggles prompting on and off. If the prompt mode is off, you will not be prompted for each file when using mput and mget.

As already mentioned, with the help command you can get a quick overview of all available commands.

```
[C:\]ftp
IBM TCP/IP for OS/2 - FTP Client ver 22:15:36 on May 20 1996
ftp> help
Commands may be abbreviated.  Commands are:

!               debug           keepdate        prompt          send
$               delete          lcd             proxy           sendport
account         dir             ls              put             site
append          disconnect      macdef          pwd             status
ascii           euc             mdelete         quit            struct
bell            form            mget            quote           sunique
binary          get             mkdir           recv            tenex
bye             glob            mode            remotehelp      trace
cd              hash            mput            rename          type
cdup            help            nmap            reset           user
close           image           ntrans          rmdir           verbose
cr              iso2022         open            runique         ?
ftp>
```

5.10.13 Setting Up an FTP Server

TCP/IP in OS/2 Warp 4 also contains an FTP server daemon that allows you to set up an FTP server on your machine. All you have to do is to start the FTPD.EXE manually when you need it, or define it in the Autostart page of the TCP/IP configuration notebook to be launched at System startup. Because FTPD is using a well-known socket port, the portmapper does not have to be started.

5.10.13.1 Defining User IDs

You can define user IDs in the TCP/IP Configuration notebook on the first Security page (see Figure 352).

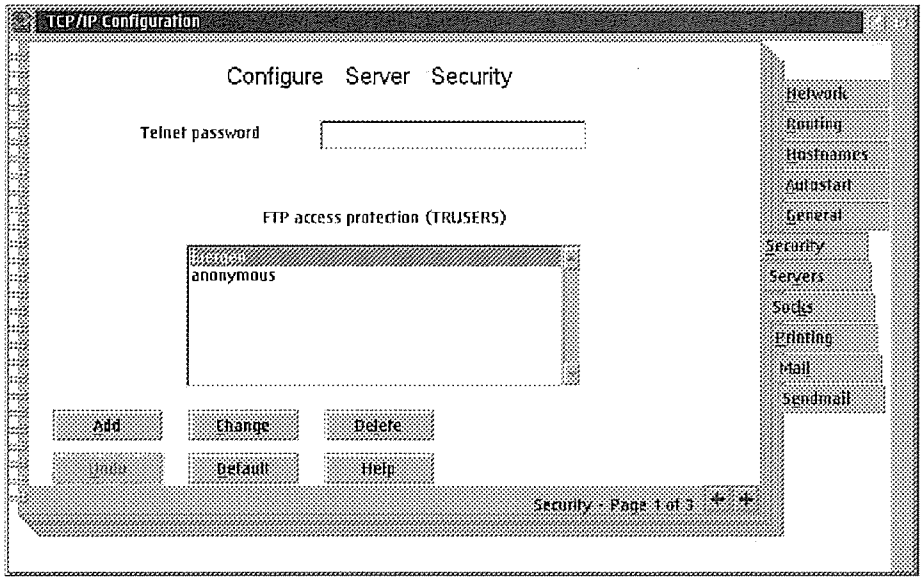


Figure 352. TCP/IP Configuration Notebook - Security Page 1/3

On this page you can define the telnetd password and the FTP user IDs. The example shows two user IDs defined, *Juergen* and *anonymous*. You can add new user IDs, change the properties or delete the selected ID by clicking on the corresponding push button.

If you want to add a new user or modify an existing one, click on either **Add** or **Modify** and you will see the panel shown in Figure 353.

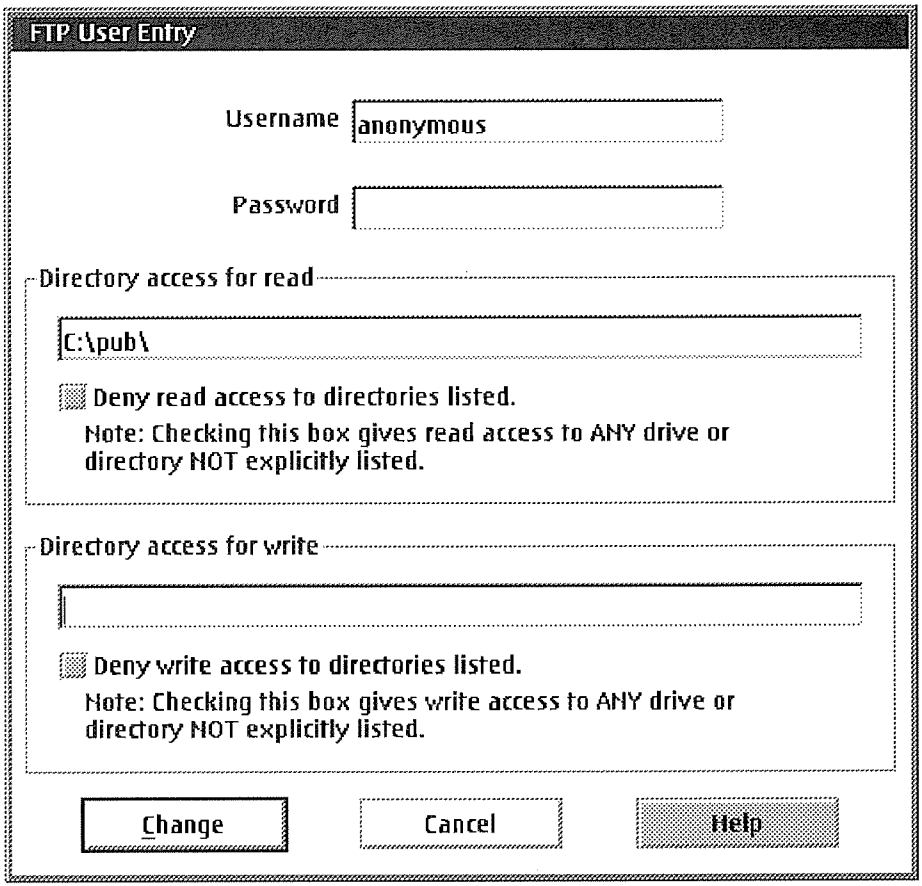


Figure 353. Add or Modify FTP User IDs

Use this panel to define the user ID, the assigned password and the rights that the user should have. The user ID *anonymous* is a common ID for unidentified access to a server; therefore no password is required for this ID.

The read access to your server can be specified in the Directory access for read entry field. Be careful what access you give, because if a user can get access to a file where password information is stored (for example, the \MPTN\ETC directory or the CONFIG.SYS file in the root directory) he can get access to your machine. For this reason, specify only dedicated directories for user IDs that are not for your personal use.

The same is true for the write directory specified in the Directory access for write entry field. If you have selected this by mistake, the entries will be reversed. That means

users that have access to the D:\PUB directory will have access to every directory except the defined one.

When both an upload (write access) and a download (read access) directory are specified, the user will be in the upload directory at logon time. If no upload directory is specified, the user will be put in the first directory specified for the read access.

If you want to specify multiple directories, separate them in the entry field by a space.

5.10.13.2 Where is the User Information Stored?

The user information that you defined in the previous section (see Figure 352 on page 604) is stored in the trusted users file called TRUSERS that is located in the \MPTN\ETC directory.

```
user: juergen dolchev
rd: c:\ d:\
wr: c:\ d:\

user: anonymous
rd: c:\pub
wr: c:\pub\upload
```

Figure 354. TRUSERS File for the FTPD Daemon

Figure 354 on page 606 shows an example of such a TRUSERS file. You can see the directories assigned for read and write access for each user.

If you want to trace the accesses to your FTP server, you have to start it with the -t parameter. FTPD will then store a file FTPD.TRC in the \MPTN\ETC directory.

5.10.14 What Else To Pay Attention To

In Figure 354 on page 606 you can also see that the password for user *juergen* is *dolche*. This example should remind you that passwords are not encrypted when using FTPD. You should never give users access to this file, since they could potentially gain access to secure data with the information obtained in this file. Fortunately FTPD will not allow users read or write access to TRUSERS even if the have read and write access to the \MPTN\ETC directory. Users could view this file and uses somebody else's ID with more privileges but they cannot change the file to add or modify user IDs.

If you want to edit the TRUSERS file manually with an editor, do not forget to press Enter on the last line, because some editors (such as the OS/2 System Editor) do not include a carrige-return line-feed automatically at the last line and without it the last line will be ignored.

5.10.15 Logon Definitions in the NETRC File

For both the FTP and FTP-PM clients you can define the user ID and password of frequently used servers. By doing this you have to specify only the host name of the machine when you want to connect to it. These definitions are made in the NETRC file in the \MPTN\ETC directory.

```
machine ausres50 login anonymous password JFriedrichs@de.ibm.com
```

For each host, you can define one line that must be terminated with a carriage-return line-feed. Otherwise this line will not be recognized. The host name of the remote host is defined after the machine keyword and is *ausres50* in this example. The user ID follows after the login keyword (*anonymous* in the example) and the password is specified after the password keyword (as usual for anonymous FTP, it is your Internet e-mail address).

To establish an anonymous FTP connection to ausres50, type:

```
ftp ausres50
```

This will automatically log on to the remote FTP server.

If you have defined a user ID and a password in the netrc file but you do not want to access the remote host with that user ID and password combination, either delete this entry from the netrc file or specify the -n option in the ftp command:

```
ftp -n ausresr50
```

The difference between this and not having the target host defined in the netrc file is that the user login prompt will not appear automatically. It will bring up the remote FTP host and you have to issue the USER command to log in to the system.

The same happens when you use FTP-PM. If you are not using a specific configured one for an FTP server, you also do not have to specify the user ID and the password, if it is already done in the netrc file.

The Workplace Shell integrated FTP client does not use the netrc file at all. If you are using this client, you always have to define connection data in the FTP server specific object.

5.10.16 Remote Login Using TELNET

Telnet allows you to log on to a remote host on any TCP/IP network including the Internet. The remote host could be part of a private corporate system or a university system permanently connected to the Internet. The remote host may use a different operating system from your PC; for example, you can use your OS/2 Warp 4 client to log in to a UNIX machine.

When you establish a Telnet session, you will see a command line from which you can enter commands. Your system will appear to the remote system as a terminal. The terminal emulation types supported by the Telnet client within OS/2 Warp 4 are:

- VT220
- VT100
- ANSI
- HFT
- NVT
- 3270
- 5250

The Telnet clients included in OS/2 Warp 4 are:

- Telnet
- TelnetPM
- Personal Communications Entry Level

The Telnet and TelnetPM clients are probably the most interesting for Internet users. These two clients support a variety of terminal types including VT100, VT220, ANSI, NVT and HFT terminal emulations.

Personal Communications Entry Level is the successor to the TN3270 and TN5250 utilities that were provided in OS/2 Warp Connect Version 3, and allows you to connect your OS/2 Warp 4 system to an IBM S/390 or AS/400 host, and emulate a 3270 or 5250 terminal. However, since many intranet hosts are not IBM S/390 or AS/400 systems Personal Communications Entry Level is most useful to corporate users who can now connect to their host systems without the need to purchase additional terminal emulation software.

More information about Personal Communications Entry Level is provided in 5.11, "Personal Communications Entry Level" on page 674.

The ASCII-based telnet clients Telnet and TelnetPM handle the other data streams such as ANSI, VT100, VT220, HFT and NVT. The text-based client is usable when you telnet in to a remote host and you have to telnet from this host again to another one. In this situation you can only use the text-based client, because starting the PM-based client will cause a Telnet client window to appear on the (first) remote host and not on yours.

The PM-based client has the advantage that it can be configured more easily. In addition, you have all the common usability advantages that a PM application has compared to a text-based application. The following sections will show you how to configure and use the two clients.

5.10.16.1 The Text-Based TELNET Client

Type `TELNET` from a command prompt to start the TELNET shell. From there the TELNET commands are available to you. These include:

```
TELNET> ?

TELNET - 08:32:06 on Aug 05 1996.
Commands may be abbreviated.  Commands are:

open            Connect to a site
close           Close current connection
quit            Exit TELNET
status          Print status information
help            Print help information
send            Transmit special characters
emulate         Specify an emulator type (VT220, VT100, ansi, hft, nvt)
set             Set operating parameters
toggle          Toggle operating parameters
display         Display operating parameters
environ         Change environment variables
!               Invoke a subshell
?               Print help information
TELNET>
```

The format for opening and closing a connection is similar to the FTP set of commands.

The normal use of the TELNET command line option is to include the remote host name as a parameter:

```
telnet bbs.os2bbs.com
```

After the logon has completed your screen will look like an ASCII terminal directly attached to the host. You can now proceed with whatever tasks you would normally perform from a terminal session.

This ASCII-based TELNET client supports a variety of terminal emulation types via the emulate TELNET subcommand. You can also define the emulation type used when Telnet is started by specifying it with the -n parameter of TELNET.EXE. For example:

```
telnet -n ANSI bbs.os2bbs.com
```

starts the telnet session in ANSI mode. If you telnet to an OS/2 host, ANSI is the best emulation mode, because the colors, commands and cursor keys can be mapped best in ANSI control sequences.

5.10.16.2 The PM-Based TelnetPM Client

It is better to use the PM-based Telnet Client than the text-based client. Using the PM version allows you to predefine certain settings such as the emulation type, number of characters per column, number of rows, whether to do a trace, keep a log, etc., much easier than with the text-based client.

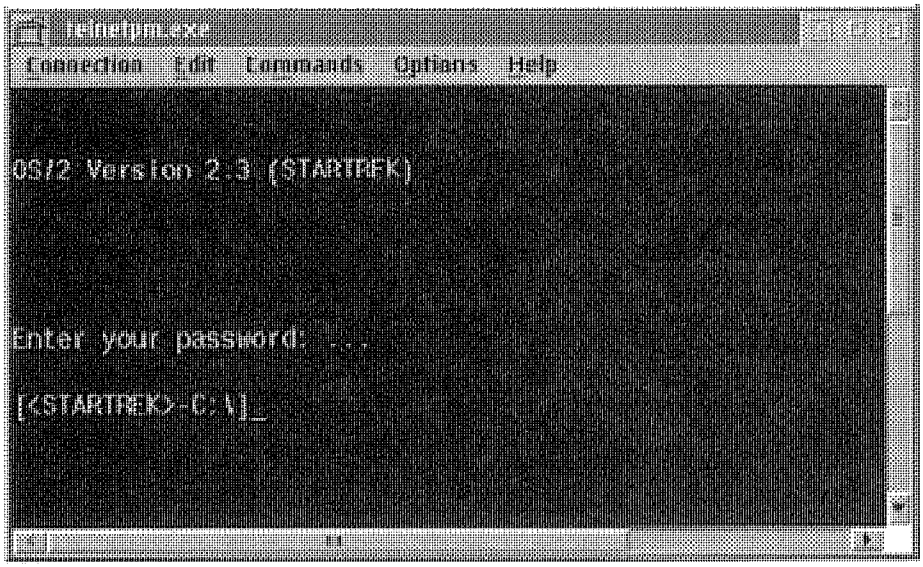


Figure 355. TelnetPM

5.10.16.3 Defining Telnet Client Objects to Specific Hosts

The TCP/IP implementation in OS/2 Warp 4 allows you to create and define Workplace Shell objects that contain the necessary configuration information to connect to a specific remote host. Please note that these objects can also be used with the text-based Telnet client.

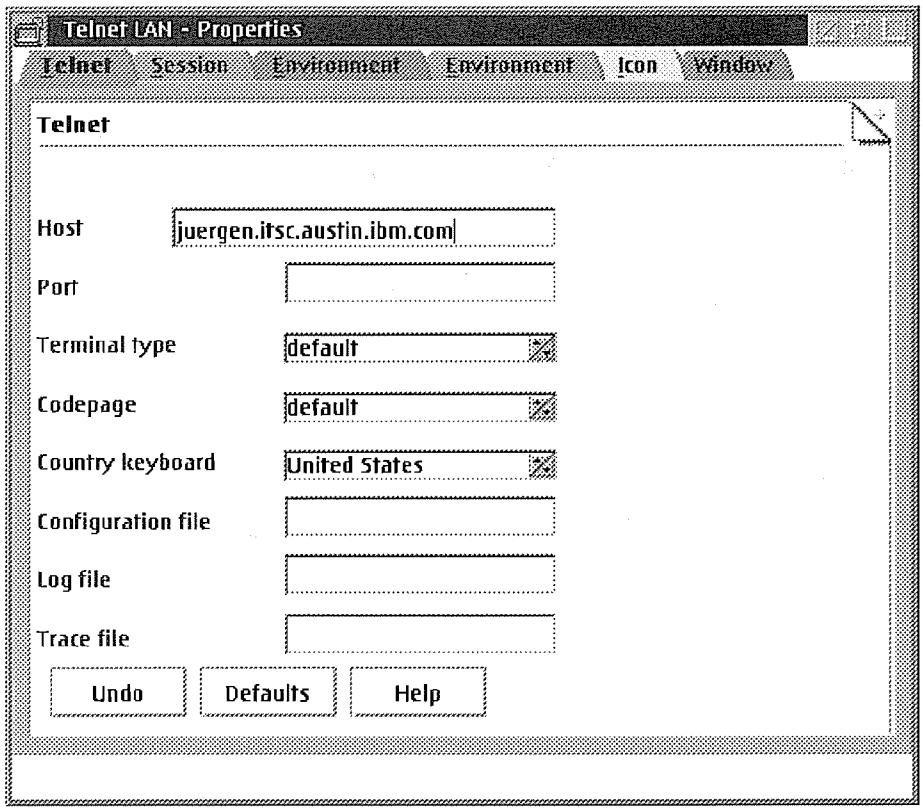


Figure 356. Configuration Notebook for Telnet Session - Page 1

To create such an object you have to drag and drop a Telnet template from the Templates for the Internet folder to the desktop. On the first page of the configuration notebook (see Figure 356 on page 611) you must specify the host name of the remote host using its IP address or host name. If you do not specify the host here, you will be prompted for it every time you use this object. The other fields on this page are not required for establishing a connection.

The port field has to be specified when the remote telnet server is not listening to the well-known IP socket port 23 that is specified in the SERVICES file in the \MPTN\ETC directory.

In the Terminal type field you can specify the terminal emulation mode that is used by default. If this telnet object is used to telnet to an OS/2 machine, you should specify the ANSI emulation here, because this is the best mode for OS/2. Telnet will use the terminal type specified by the -t parameter. If no default is specified the terminal type will be negotiated with the server in the following order:

1. VT220
2. VT100
3. ANSI
4. HFT
5. NVT

If the remote server expects a specific TERM-string, you can specify it in the CONFIG.SYS (but then this setting will be valid for all sessions) or you can specify it in the Environment page of the configuration notebook. To set the TERM variable to "vt110-sun" include the following line:

```
TERM=VT110-SUN
```

The Codepage field can be used when the code pages used on the remote host and the local machine do not match. When a code page is specified here, the transmitted characters will be translated in the appropriate character of the local host.

In the Country Keyboard field, you can select the way your keyboard will be mapped for the telnet session. Normally you will use the keyboard mapped to its physical layout and as you have it configured in your operating system. This field gives you the choice to use a different keyboard layout as the default one.

If you have to remap particular keys or you want a different color configuration for the telnet emulation, you can define such a configuration with the setterm command and then specify the configuration file in the Configuration File entry field.

In the Trace file and Log file entry fields, you can enter the log files. While the trace file is only needed to analyze Telnet connection problems, the log file can be useful for looking at an old session.

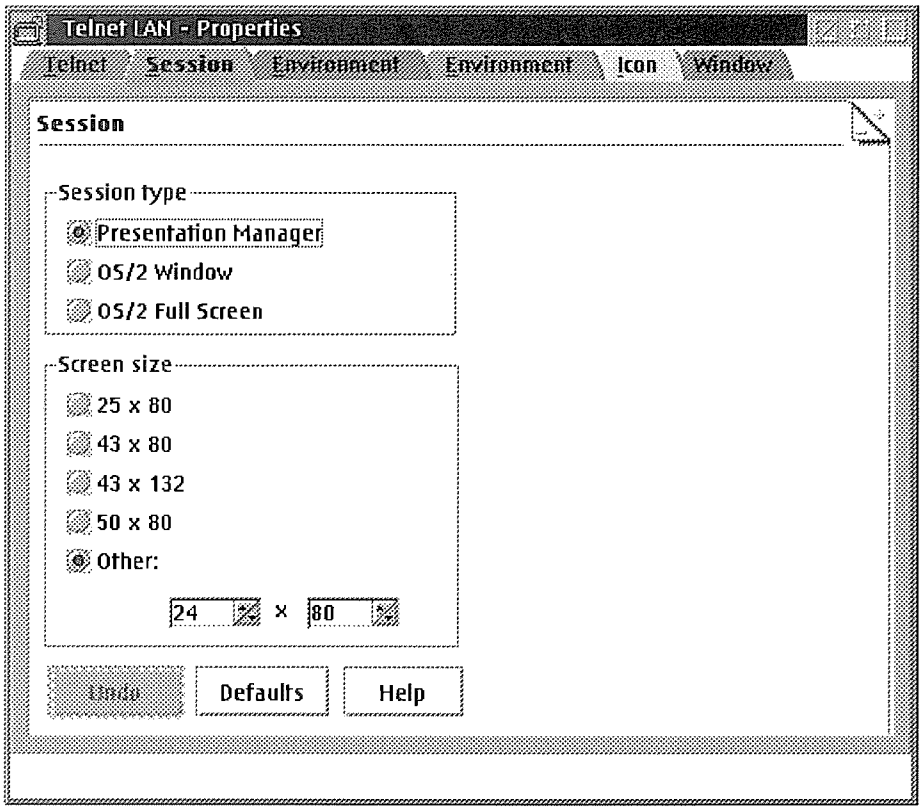


Figure 357. Configuration Notebook for Telnet Session - Page 2

On the Session page (shown in Figure 357 on page 613), the screen size can be defined either by some default values or by a user-defined number of rows and columns.

The Session type defines what type of Telnet session will be launched. The choices are:

- Presentation Manager (TelnetPM)
- OS/2 Windows (Text-based Telnet in a window)
- OS/2 Full Screen (Text-based Telnet in a full screen)

5.10.16.4 Creating a Telnet Configuration File

It may sometimes be necessary to change the meaning of a key, for example when there is no appropriate keyboard support or you want to extend some of the keys with additional functionality. You may also want to change the default color setting. To do this, you can run the Keyboard Configuration or the SETTERM.EXE command.

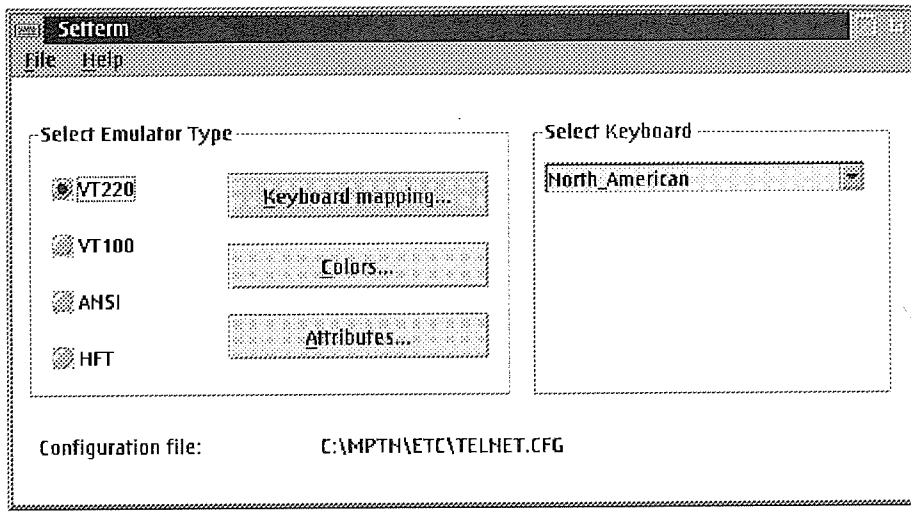


Figure 358. SETTERM - Configure the Telnet Session

In the first dialog box you can select the configuration file that you want to modify. By default TELNET.CFG is loaded, but you can load any other configuration file. The first step of the configuration should be the selection of the keyboard type and the emulation type that you want to use. Click on the **Attributes** button to specify some of the Telnet characteristics. VT220 has an additional setting in this submenu to specify a local line printer that is normally supported by this VT220 protocol.

The definition of colors is very easy for HFT and ANSI emulation, since their data streams have their own control sequences to modify colors with. Therefore they only have settings for the default foreground and background colors. The configuration for VT100 and VT220 includes the color definitions for *bold* and *underlined* text.

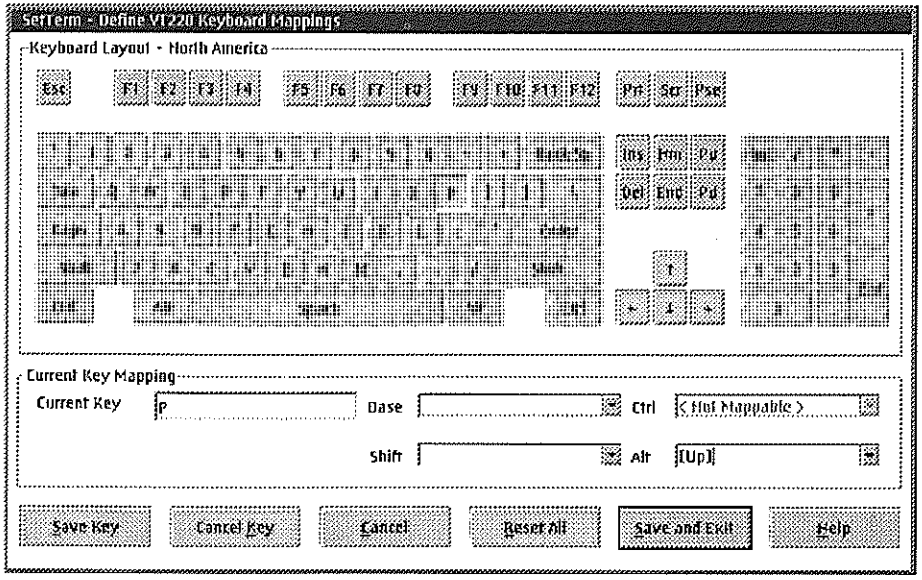


Figure 359. SETTERM - Remap Keyboard

If you click on the **Keyboard mapping** button, you get a dialog box where you can remap your keyboard for a selected terminal emulation mode (see Figure 359 on page 615). Some of the keys, such as the Shift or Control keys, are not mappable. Other combinations, such as Ctrl+P for example, have particular meanings in VT100 and other terminal emulation modes and cannot be remapped. If, for example, you want to define Alt+P as Cursor Up, select the P on the displayed keyboard and go to the Alt entry field. Open the selection box and look for [Up]. If you use Telnet with this new configuration file, you can use the Alt+P key combination to move the cursor up.

5.10.17 Setting Up a Telnet Server

OS/2 Warp 4 includes a Telnet daemon called telnetd that enables remote telnet clients to log on to your system.

Since OS/2 is a single user non-secure system, clients get complete control of the system when they access it via Telnet. It is therefore important that passwords are used and distributed with care.

If you log on to the OS/2 Warp 4 telnetd daemon, you are only prompted for the Telnet password of the system, because it has no user IDs as in UNIX. The password can be set either in the environment variable called TELNET.PASSWORD or directly by using the -u parameter when the telnetd daemon is started. By default, the TELNET.PASSWORD will be set in the CONFIG.SYS file when using the TCP/IP Configuration notebook (see 5.10.7.6, "The Security Configuration Pages" on page 567).

It is important in which command shell environment the telnetd is started. If you want to start the telnetd as a part of the inetd, you cannot use the -u parameter to set the password, since in this case no parameters are accepted.

To run the telnetd daemon you can select it in the Autostart page of the TCP/IP Configuration notebook or just do it manually by typing `telnetd.` at an OS/2 command prompt.

If you require more documentation regarding the telnet server, refer to the TCP/IP online documentation in OS/2 Warp 4.

5.10.18 REXEC and RSH Client and Server

The TCP/IP implementation in OS/2 Warp 4 provides users with tools to access remote computers and to be accessed by remote computers. Two methods are described in this section that allow you to execute commands on a remote machine. These methods require only a few interactions by a user. Both functions are very similar and are only different in the way they implement security.

> **Note**
>
> Anybody who has the right to execute REXEC or RSH commands on your machine has complete access to all files on your machine.

5.10.18.1 Differences between REXEC and RSH

From a user's viewpoint, there are only minor differences between Remote Execute (REXEC) and Remote Shell (RSH). Both commands allow you to execute a command on a remote host and to get the result to the local system. The biggest difference can be found in the security implementation of these commands.

When the REXECD daemon is running on the remote host, you have to identify yourself with a user ID and a password. This allows you to execute commands with rexec from any host in the network. The security is on the remote host on which the command is executed.

When the remote host runs the RSHD daemon, it has a list of defined hosts that are allowed to execute commands with RSH. It can also specify that only specific users on a remote host are allowed to execute commands. This makes sense when the host launching the command has user security such as, for example, UNIX. For example if you allow a user *root* on the host aixtest.itsc.austin.ibm.com to execute commands on a local host, the authentication for the user root is done on the remote host. Every OS/2 user that has access to the local machine with a defined IP address or host name can issue a command.

For this reason it has been decided to split the security between:

- The host running RSHD

On this host it is defined which machines with which IP addresses are allowed to execute RSH commands

- The machine issuing the RSH command

  Local user authentication is done here.

5.10.18.2 Using the REXEC Command

The rexec command can be specified on a command prompt or from a batch file.

```
[C:\]rexec -?

 IBM TCP/IP Version 2.0 for OS/2
 REXEC last updated Apr 15 1996 22:56:52 by Ojan Majlessi

Usage:
►►─rexec─<host>─┬──────────────┬─┬──────────────┬─┬─────┐
                └ -l <loginname>┘ └ -p <password>┘ └ -n ┘

►──┬─────┬─┬─────┬─┬─────┬─<command>─►◄
   └ -b ┘ └ -k ┘ └ -i ┘

<host> Specifies the remote host on which the command is to be issued.
-l <loginname>
       Specifies the user ID on <host>.  If you do not specify a login name,
       the values in the NETRC file are used.
-p <password>
       Specifies the password that is associated with the login name.  If you
       do not specify a password, the values in the NETRC file are used.  If
       the NETRC file does not provide the password value, REXEC prompts you
       for the password.  You can enter the password in a nonecho mode.
-n     Specifies not to use the NETRC file for automatic login.
-b     Uses binary mode for the data transferred to and from the remote host.
-k     Ignores the local keyboard input.  This is helpful for running
       noninteractive input, especially from a batch file.
-i     Uses interactive mode for input.  REXEC reads directly from the keyboard
       instead of stdin.
<command>
       Specifies the command to be issued on the remote host.  The command
       must be in the syntax used by the remote host.

[C:\]
```

If you do not specify a user ID or password with the -l and -p parameters, OS/2 Warp 4 will check in the netrc file for a user ID and password that matches the specified host. If the host is not defined, you will be prompted for a user ID and a password. Note, user IDs and passwords are case sensitive!

To reboot a remote machine to which you have access to with the rexec command, type:

```
rexec -l master -p secret SETBOOT /B
```

The rexec user ID and password in this example are master and secret.

5.10.18.3 Using the RSH Command

Most of the rules we discussed for the rexec command are also valid for the RSH command.

The definition of hosts that are allowed to execute a RSH command on the remote host is done on the remote host. The user identification is normally done on the local host. If you issue a RSH command, it will first check if there is a -l parameter with a user ID specified and if not, it takes the value that is set in the USER environment variable. If

there is no such a variable defined, it automatically assumes that the user name is OS2USER.

```
[C:\]RSH -?

 IBM TCP/IP Version 2.0 for OS/2
 RSH last updated Apr 15 1996 22:55:54 by Ojan Majlessi

Usage:
                    ┌ -l USER environment variable┐
▸▸─RSH──<host>──┤                             ├──────────────────────────────▸
                    └ -l <loginname>──────────────┘

   ┌ -u value of -l argument┐
▸──┤                        ├──┬────┬──┬────┬──┬────┬──<command>──▸◂
   └ -u <local loginname>──┘  └ -n ┘  └ -b ┘  └ -i ┘

<host> Specifies the remote host on which the command is to be issued.
-l <loginname>
       Specifies the user IO on <host>.  If you do not specify this parameter,
       the value of the USER environment variable is used.
-u <local loginname>
       Specifies the user ID on the local machine.  If you do not specify this
       parameter, the value of the -l option is used.
-n     Ignores the local keyboard input.  This is helpful for running
       noninteractive input, especially from a batch file.
-b     Uses binary mode for the data transferred to and from the remote host.
-i     Uses interactive mode for input.  RSH reads directly from the keyboard
       instead of stdin.
<command>
       Specifies the command to be issued on the remote host.  The command
       must be in the syntax used by the remote host.

[C:\]
```

Because there are no user IDs on OS/2, you must specify a user ID using either the -u or -l parameters <loginname> <local loginname>. as a kind of password by defining a user ID on the remote host. A security implication of doing this is that anybody that get read access to the \MPTN\ETC directory on the remote host and can read the configuration file and all user IDs because they are not encrypted.

5.10.18.4 Configuring a REXECD Daemon

The REXECD daemon is the server part of the rexec command. Because you can only run one REXECD daemon at a time, you can also only specify one user ID. This is not a problem because the host that has rexec authority on your machine can get access to *all* data! This is a risk that you should always be aware of. Furthermore, if you define the required USERID and PASSWD environment variable within the TCP/IP Configuration notebook (see Figure 360 and Figure 323 on page 569), the two values will be set in the CONFIG.SYS file. It will therefore be set in the environment space of all applications, which means every application has access to the defined user ID and password.

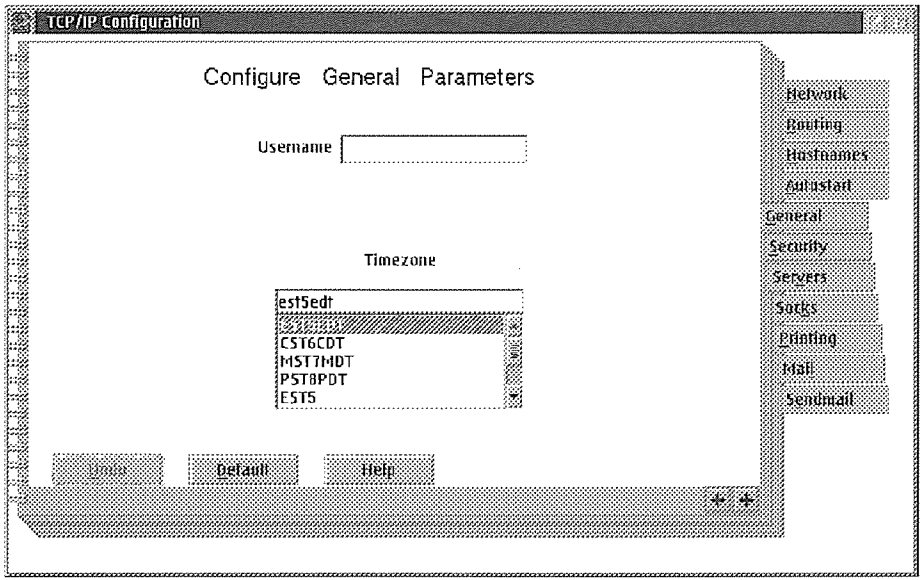


Figure 360. Defining the USERID for The REXECD Daemon

This could cause additional security problems, since even an application that does not intend to be a spy can export its environment to an external host. For security reasons it is much better, if the USER and PASSWD environment variables are set just before the REXECD daemon is started, so that these two environment variables are not available in the environment space of each application.

If the main goal is to protect system resources, the REXECD daemon should be started as a part of the inetd daemon process. This also means that it is more difficult to set the environment variables for user ID and password for the REXECD daemon only.

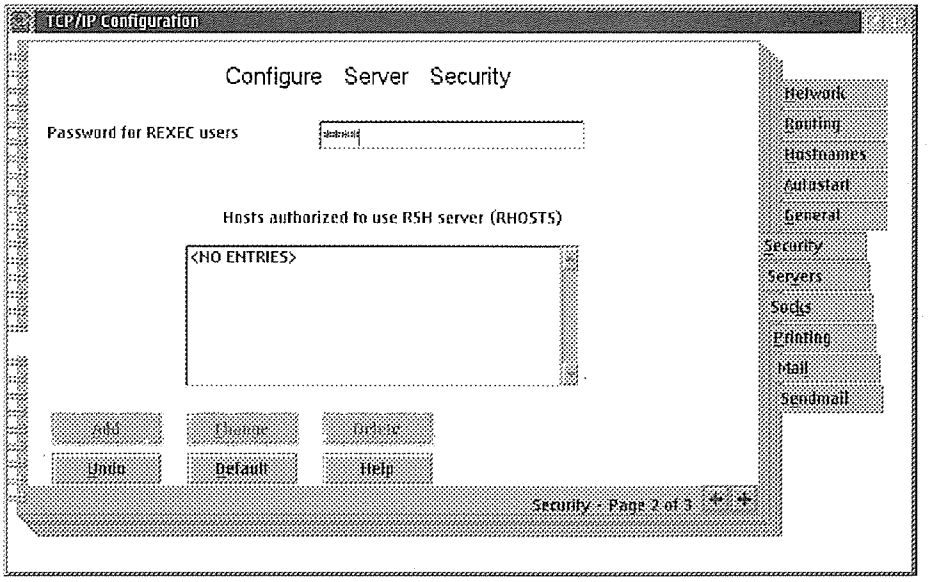


Figure 361. Defining the Password for the REXECD Daemon. On this page you define the password for the REXECD daemon and the trusted hosts and users for the RSHD daemon.

5.10.18.5 Configuring RSHD Daemon

Using the RSHD daemon can be safer than using the REXECD, even if there is no user password specified. You can define the host that has access from trusted users, and even without a password it is more difficult to get a domain name or IP address from an external LAN. This is because routers will not transport IP packages in directions that they are not supposed to. However, in an internal LAN environment it is very easy to use somebody's else IP address that is defined as a trusted user in your system. Even a RSHD daemon cannot be made really secure in an OS/2 environment.

To define the trusted hosts and user IDs for a remote host, you can either use the TCP/IP Configuration notebook (see Figure 323 on page 569) or edit the file RHOSTS in the \MPTN\ETC directory directly. Any changes will be active right away without restarting the RSHD daemon.

In both cases you have to define the host name and domain name of the trusted host and optionally a user ID that is trusted on the remote host.

For example, if you only trust the user root in the domain aixsystem.itsc.austin.com, you must specify the following line in the RHOSTS file:

```
aixsystem.itsc.austin.com          root
```

If you want to allow any user from the domain aixsystem.itsc.austin.com to access your system via RSH, you do not have to specify any user name.

5.10.19 NewsReader/2

Reading and posting of news items are integral parts of the Internet. USENET, a network for this purpose, has now been integrated into the Internet.

There are thousands of Internet newsgroups, each with its own unique subject. There are seven main categories of newsgroups, each of which contains many related groups. In addition to the newsgroups defined by USENET, there are also servers that hold and distribute their own newsgroups, which themselves may fall into a variety of news categories. All of these together constitute the world of news on the Internet, and you can access all of them using NewsReader/2.

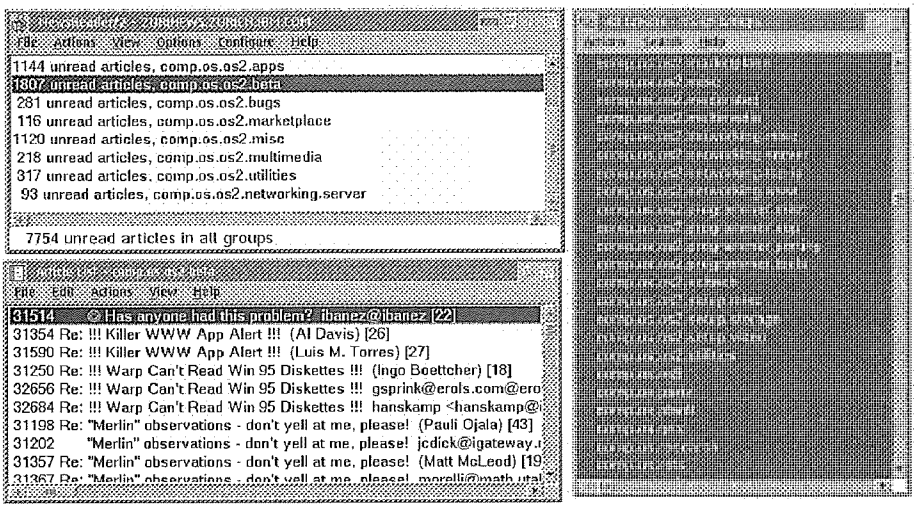


Figure 362. NewsReader/2

Note that the newsgroups available to you on the Internet will differ depending on the news server to you are attached to. Internet service providers select the newsgroups that will appear on their servers, and not every provider will carry every available newsgroup. In some cases, governments may prohibit certain news categories from being carried on servers within a particular country.

5.10.19.1 Preparing to Use NewsReader/2

To use NewsReader/2, you must specify the name of a news server that contains the newsgroups that you want to view. For example, the news server for CompuServe is called news.compuserve.com.

In many cases, your Internet Service Provider will have a default news server, configured automatically when you connect to the Internet. If not, you can specify the name of the server manually in the dialer program.

5.10.19.2 How to Select Newsgroups

When you are connected to a particular news server, you need to tell NewsReader/2 what newsgroups you are interested in. If you know the names of the newsgroups you wish to subscribe to, you can enter them by using the Actions pull-down menu. If you do not know the names, you must obtain a complete Newsgroup List from the news server. To get this list, select the **File** menu from the NewsReader/2 menu bar, and select **List all newsgroups** from the resulting pull-down menu.

When you choose **List all newsgroups** for the first time, NewsReader/2 automatically downloads the complete list. The list is then stored on your computer and if you later select **List all newsgroups** again, you have the option of using the current list, or downloading a new list from the news server. You make this choice using a dialog box as shown in Figure 363 on page 622).

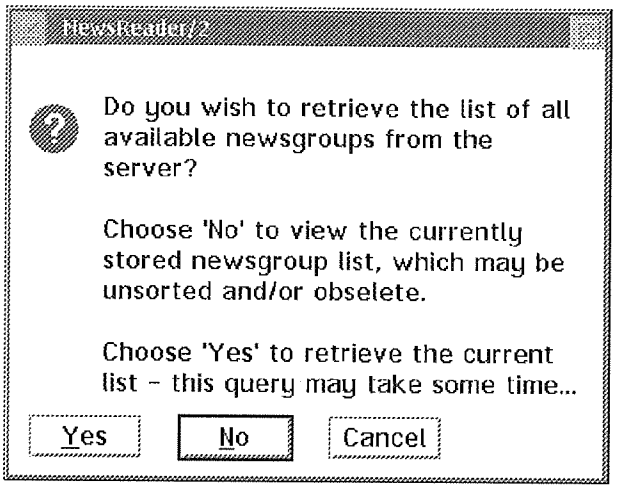


Figure 363. Downloading a New List of Newsgroups

In most cases, you can simply select **No**, and then select the newsgroups you require from the current list on your computer. However, you should note that some news servers may add newsgroups for new subjects at regular intervals. Whenever you start NewsReader/2, the program checks the date and time of your current newsgroups list. If your list is more than a week old, NewsReader/2 will ask whether you wish to download an updated list. Whether you do so is up to you, but the new list may include additional subjects of interest to you.

However, downloading a new list is not the only way of being notified of new groups. Every time you start NewsReader/2 and access the news server, NewsReader/2 will automatically display a list of new groups added since the last time you access the news server. You can then choose new groups to be added from this list although they are not included in the list you downloaded the first time.

5.10.19.3 How to Subscribe to Newsgroups

To subscribe to a newsgroup, open the All Groups window by selecting the **List all newsgroups** option from the File pull-down menu. You will then see a complete list of all the newsgroups available on your news server.

Select a group by double-clicking your mouse on it. You will see the name of the group added to the NewsReader/2 main window, along with the number of unread articles in that group. To display a list of those articles, double-click your mouse on the name of the group in the NewsReader/2 main window. NewsReader/2 will then display the articles in the Article List window.

Since the list may contain 15,000 or more newsgroups, it is often hard to find the newsgroup that you want. To make this easier, the All Groups window provides a search function. You can use the **Find...** item in the Search menu, or press Ctrl+F, and specify a key phrase. NewsReader/2 will find the first newsgroup with a name containing that phrase.

If you want to continue searching, you can click on **Find Next** or press Ctrl+N to keep searching as much as you want. If you begin a new search through the list, remember to go to the top of the list by pressing Ctrl+Home, since the search routine begins from the current position in the list, not from the top.

To subscribe to a newsgroup, double-click your left mouse button on its entry in the All Groups window. The name of the newsgroup will be added to the main NewsReader/2 window, along with the number of unread articles currently stored in that newsgroup on your news server.

5.10.19.4 Displaying a List of Articles

To obtain a list of the articles in a newsgroup, double-click your left mouse button on the newsgroup's entry in the main NewsReader/2 window. NewsReader/2 will then download the article list from the news server and display it in the Article List window, as shown in Figure 364.

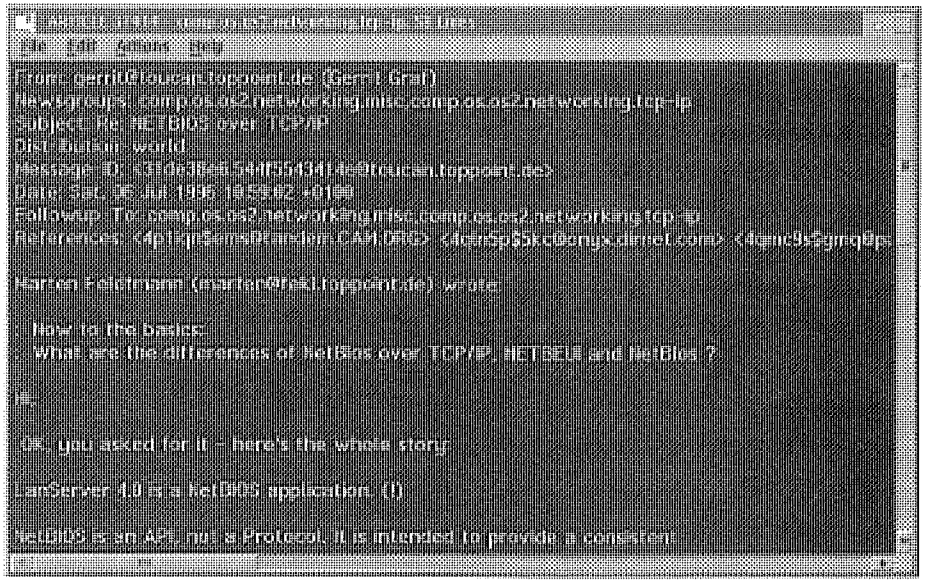


Figure 364. Displaying a List of Articles

When you display a list of articles in the Article List window, you will see articles relating to many different topics of discussion within the overall subject of the newsgroup. You can browse through this list and select the articles in which you are interested.

Note that NewsReader/2 keeps track of which articles you have read in each of the newsgroups to which you subscribe. When you ask for a list of articles, NewsReader/2 normally shows you only those articles that you have not already read. If you wish to see *all* of the articles including those you have already read, you can select **View** from the menu bar of the Article List window, and select **Include All** from the resulting pull-down menu.

By default, articles are sorted in the order that the news server has received them. Since articles with the same topic can therefore appear in different places in the list, it can be difficult to follow the discussion on a particular topic. You can make this simpler in a number of ways:

- You can find the first article on the topic you want to view, then press Ctrl+S to display only the postings that have the same subject title.
- You can select the **View** menu in the Article List window, then select the **Sort** item from the resulting pull-down menu. You can then sort articles by subject.

Note that these methods will only sort the Article List window for the current list. To alter the default sort order for articles in the Article List window, select **Options** in the main

NewsReader/2 window, select the **NewsReader/2..** option from the pull-down menu, and use the Article list auto-sorting group of radio buttons to change the sort order.

5.10.19.5 How to Read Articles

Now we come to the interesting part: reading an article. When you double-click your left mouse button on an article in the Article List window, NewsReader/2 will open a separate window to display the contents of this article (see Figure 365 on page 625).

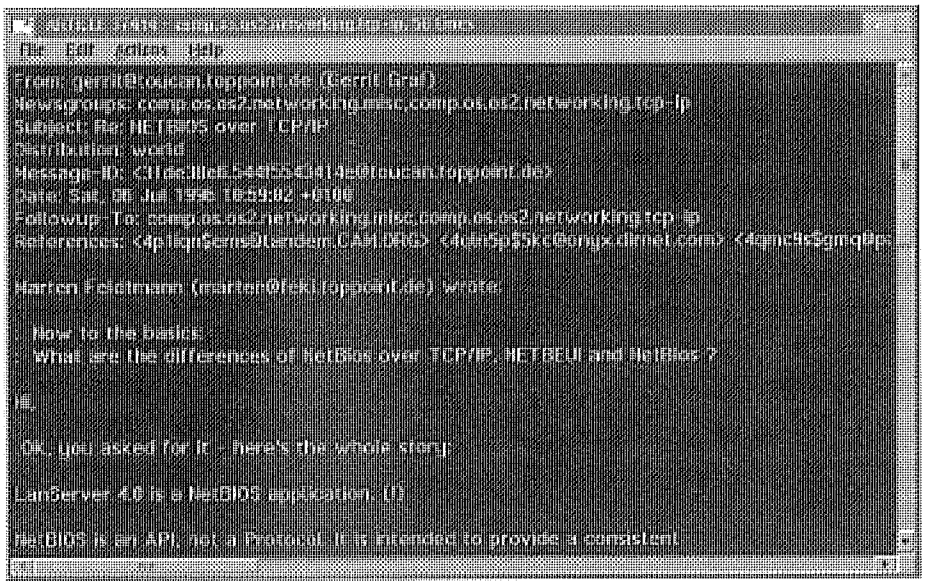


Figure 365. Reading an Article

Each article is only downloaded from the news server when you decide to read it. Downloading an article may take some time, particularly if the article is large and/or contains binary data (such as an image file).

To scroll through an article, you can use the scroll bars on the bottom and right-hand side of the window, or you can use the Spacebar. Using the Spacebar is possibly the best way to scroll, because whenever you reach the end of an article, NewsReader/2 will automatically load the next one. This is very useful if you are following a discussion involving several articles on the same topic.

5.10.19.6 Posting to Newsgroups

After you have read a number of articles, it is likely that you will want to add your own comments to the discussion. NewsReader/2 allows you to do this, and the following sections explain how.

Note

Whenever you place an article on a newsgroup, you should always use mixed case. Typing only in uppercase, while it may be faster, is regarded as "shouting" and is considered bad manners. If you persist in such behavior, you are likely to attract angry articles and e-mail messages in response to your articles. This is known as being "flamed," and is not a good thing.

5.10.19.7 Configuring Your Header Information

Before you place an article on a newsgroup (this is known as posting the article), you need to configure some information that will be included in the article, such as the e-mail address by which anyone reading your article can contact you, and so on.

To set this information, select the **Configure** menu from the menu bar of the main NewsReader/2 window, and select the **Posting...** item from the resulting pull-down menu. NewsReader/2 will display a window like that shown in Figure 366.

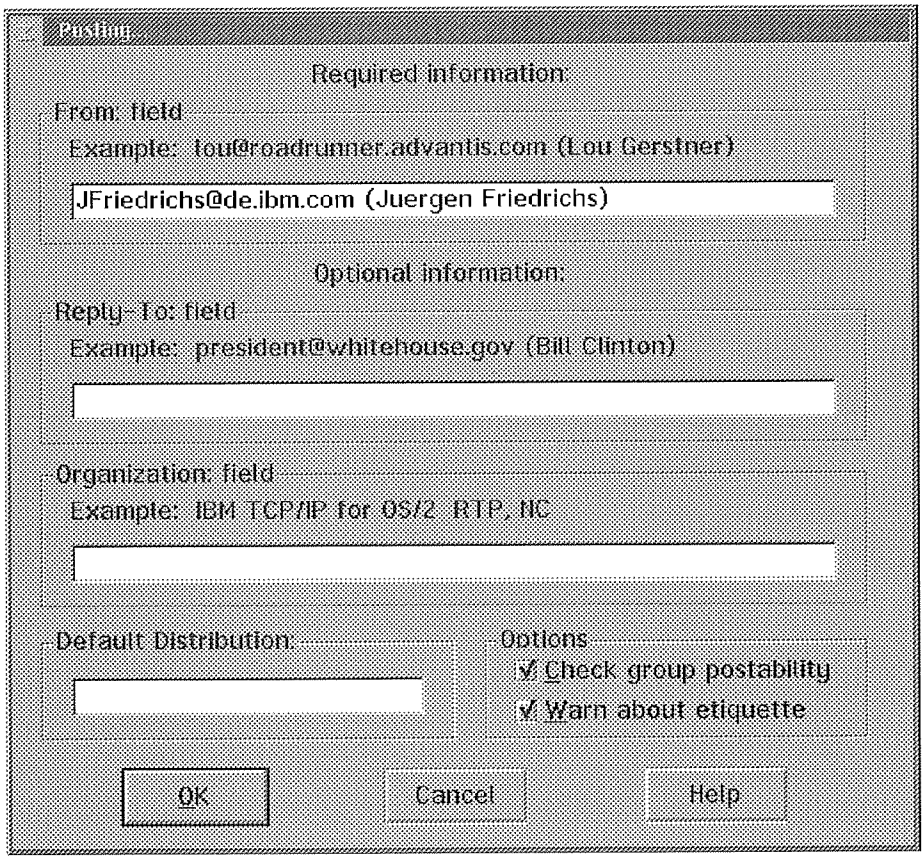


Figure 366. Configuring Your Postings

The only required field in this window is the From: field. In this field, you would normally place your name and your Internet e-mail address, as shown in Figure 366. However, you can place any other information, such as a nickname, in this field. Remember to keep it short, since other people on the Internet might not be interested in your lengthy attempts at humor.

This is the only information you need to configure in order to post articles to newsgroups.

5.10.19.8 How to Define Your Signature

One item that you might want to set up (it is optional) is a signature file, the contents of which are placed at the end of every article you post to any newsgroup. In the signature file, you can put information such as your name, the name of your business (if you have one), and perhaps some slogan in which you believe passionately, such as:

```
Regards,
   Juergen Friedrichs
-------------------------------------------------------
Air conditioned environment - please do not open Windows!
```

To create a signature file, select the **Options** menu in the main NewsReader/2 window, and select the **Signature...** item from the resulting pull-down menu. NewsReader/2 will display a dialog box like that shown in Figure 367 on page 628.

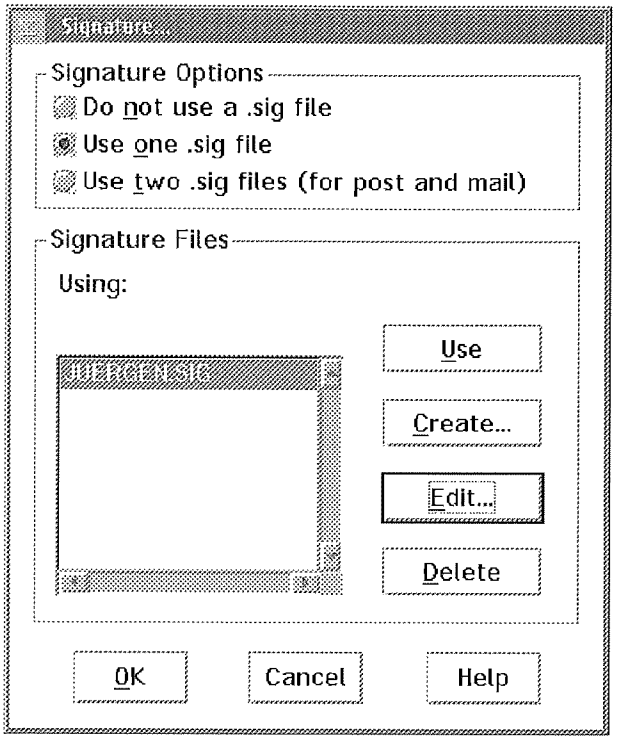


Figure 367. Selecting a Signature File

You can decide not to use any signature file, to use only one signature file for newsgroup articles and for e-mail messages from NewsReader/2, or to use separate signature files for newsgroup articles and e-mail messages. If you decide that no signature file has to be used, then naturally you do not need to specify a file. If you want to use separate signature files for mail and newsgroup articles, NewsReader/2 will automatically use the files named MAIL.SIG and POST.SIG. If these files do not exist, you can use the Create push button to create them. If you want to use only one signature file, you do not need to use a particular name for the file. For example, you could use ROB.SIG for a user named Rob or JUERGEN.SIG for a user named Juergen.

5.10.19.9 How to Reply to Articles

You will most often want to join in an existing discussion by answering someone else's article. It is quite easy to do this. When you have loaded the article to which you want to reply, you can either post a reply to the newsgroup for everyone to read, or send an e-mail message to the person who posted the article, in which case your comments will be read only by that person.

To reply to an article, select **Action** from the menu bar in the Article window, then select **Post reply...** or **Mail reply...** from the resulting pull-down menu. NewsReader/2 will display a warning message. You can turn off this message by deselecting the **Warn about etiquette** check box in the Posting... dialog box (see Figure 366 on page 627).

After this message, NewsReader/2 will display a window allowing you to enter your reply, as shown in Figure 368 on page 629.

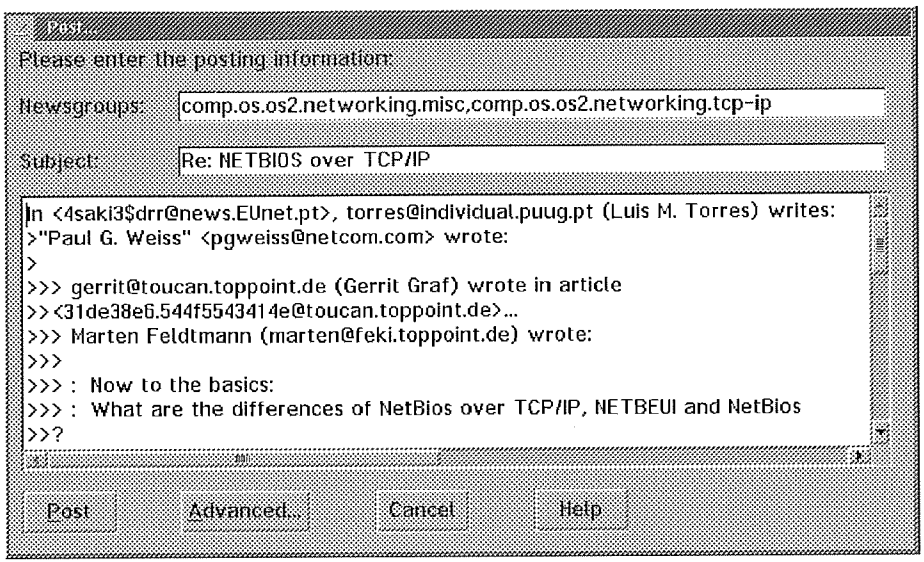


Figure 368. Replying to an Article

Note that the Newsgroups and Subject fields are automatically filled in by NewsReader/2, and the text of the article to which you are replying is presented in the main entry box. This allows you to refer directly to the other person's article when writing your reply. Note that you should delete any part of the original article to which you will not refer, since the additional text will otherwise take longer to upload to your news server, and take longer for any other readers to download to their computers. Such behavior is considered good manners on the Internet.

If your comments are directed specifically to the person who wrote the article to which are replying, and are probably not of interest to others who may read the newsgroup, you should reply using e-mail. This avoids cluttering up the newsgroup with unnecessary information (though this often happens anyway) and is also considered good manners.

5.10.19.10 How to Create a New Article

Creating a new article is very similar to answering an existing article. You will normally want to create a new article if you are asking a question on a newsgroup, where the topic is not currently under discussion, or where you wish to start a new topic of discussion.

The biggest difference between creating a new article and replying to an existing article is the place where you launch the dialog box to fill in the text of your article (see Figure 369 on page 630).

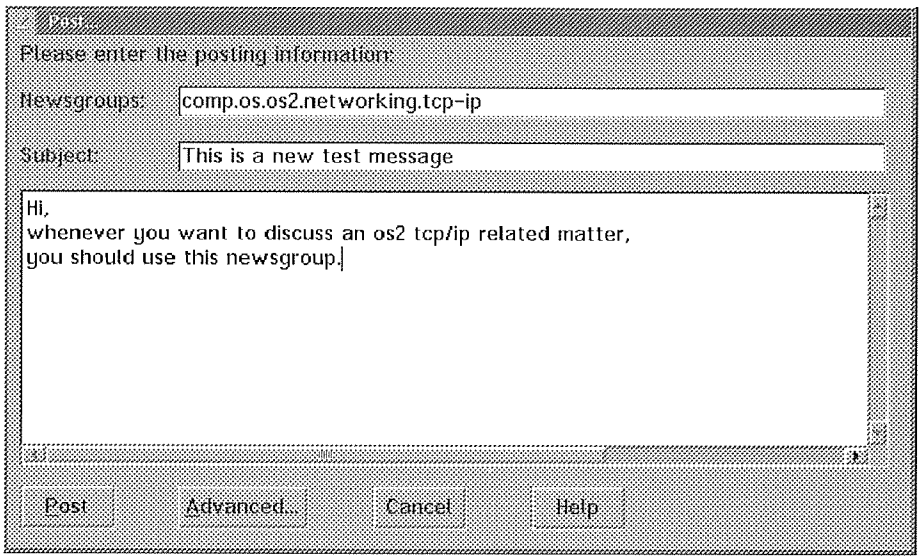


Figure 369. Creating a New Article

To create a new posting, select the **Post...** item from the Actions menu in either the main NewsReader/2 window or the Article List window. If you select the item from the Article List window, the Newsgroups field will automatically show the newsgroup currently displayed. The same thing happens if you select **Post...** from the main NewsReader/2 main window, except that the Newsgroups field shows the newsgroup that is currently selected in the list. Of course, you can overwrite this entry if you wish, but it easier (and less error-prone) if you always select newsgroups for posting in this way.

5.10.19.11 ROT13 Encoded Articles

You may occasionally see articles that appear full of garbage. This is because some articles on newsgroups are encrypted by the person who posted them. There is a simple encryption mechanism known as ROT13 that rotates the letters of the alphabet by 13 positions. This mechanism is used if someone is posting some text that might offend other people. For example, you might be discussing a new murder-mystery movie and you do not want to post the name of the murderer in clear text. You can use ROT13 to scramble your article, so that people can only read it if they first descramble it.

Note that ROT13 is *not* a way to transfer data securely over the Internet. Anyone who has a news reader with an unrot13 option, or who is willing to spend some time with a pencil and paper, can decode an article scrambled with ROT13. If you want to send your credit card number to someone using ROT13 encryption, you should expect a very expensive time!

Unfortunately, NewsReader/2 does not allow you to encrypt postings with the ROT13 algorithm. You can only decrypt existing messages by selecting the **File** menu from the Article window, then selecting the **unrot13** item, or by pressing Ctrl+Shift+U in the Article window.

5.10.19.12 Binary Data in Articles

Some articles in newsgroups may contain binary data such as programs or pictures. There are many newsgroups (such as alt.binaries.startrek) that are created specifically for the purpose of exchanging pictures. Since a news server, by nature, is only a text-based server, some ingenious people found a way to translate binary data to simple text.

There are several methods of encoding binary data into articles on newsgroups; the most common of these are Base64 and UUE. A sample article encoded in UUE format is shown in Figure 370 on page 631.

```
begin 644 graphic.gif
M1TE&.#=AJ' P /'' /___P'' "P'''' J  P'' "_H2/J<QM#Z.<M-J+L"Z\
M¬P¬&XN0$B7D%*DJV[0NPACS)-(SG&'U#=Z\+"AF\FGIV¬!&3,>;PD5M)FTD6
MTGBT4K?0MJ0HS7*="").V"?2J-V"%>:$\O]=T3QN)7B;GQWS"KU$4TX='M$(E
M5C0&R&C78=,8~9%& 2EYN4,IO8C9Z?D)&BHZ2EIJ>HI:IECBN/G"-XJB*=M+
MYJ2Y6HEH0>M"RMJX<¬+6"Y<!6R&XQ7FV9\9,+-N,A6;3; 6;!?VV38TGQMQ;
M=K0\:%EM5"0H=YN>+UT%K"5'3WM%KZX(MS?V2S8G3I6_0.O"./O&3U4Y2/,4
M-AQ6MF"_O80,ME/(;V 5Y'WY'+KY9z¬8/X 9N8Q<=))BP'3(C$W<D'#8/GPJ
M+XJCR<WE/'DL9S+Y=Y&FQXXVW?'1N(H3167DC-YL !#;N&4MD4;=$M-HTZ+H
M6-HJ%N55+&%/>B7[¬LGLU"%*)M5-FRJNW+ETZ"K50Q&D#UV\/JHUA?O16+TU
M(':C:_4!KL!04_Q$BUA,-*POGYVOC+W'%'>4LT)&M/2IOXT¬IZFKIQ+?E;LV
M4U;¬>C(,4X:CE;'..E"I:"R'3PL<>NXVP9CK8.<S356>S]M"KU(E%O'WMM>;
5:W*._E>X"NW<NWO_#CZ\¬#H% ''M

end
```

Figure 370. Example of a UUE-Encoded File

Encoded files must be converted back to binary form before you can use them. To do this, you will need a decoder program. Unfortunately OS/2 Warp 4 does not provide a decoder, but you can obtain such programs from the Internet. The FTP server ftp://hobbes.nmsu.edu includes a number of such programs in its /os2/archiver directory.

Some recommended programs are UUDOALL for UUE-encoded files, and MPACK, which will convert both UUE and Base64 formats.

One useful feature of NewsReader/2 makes it very easy to convert binary files using these tools. If you create a program reference object for each of these tools in a folder on your Workplace Shell desktop, you can run the program against an encoded article, simply by using your right mouse button to select the small icon at the top-left corner of the NewsReader/2 Article window, and dragging it over the program reference object for the decoder program. This will invoke the decoder and feed the article text directly to it, resulting in a binary file located in the default working directory for the decoder program, as specified in the program reference object.

5.10.20 The Gopher Client

Gopher allows you to navigate your way to a particular resource on the Internet, through a hierarchy of menus that connect many different hosts together. Using Gopher, you do not need to know such things as Internet addresses or domain names.

Gopher provides a very quick way of getting to the resources you need, but its one drawback is that it only supports a text-based interface, whereas most Internet sites nowadays provide graphical information.

5.10.20.1 Configuring the Gopher

The one thing you need to configure when using Gopher is the address of the first Gopher site that you will access. This site acts as a starting point for your exploration; you can link to other sites from there.

If you connect to IGN, the logon process defines a default Gopher starting point at www.openlab.advantis.net. However, if you connect to another service provider, the initial configuration notebook asks you for a Gopher server. It does not matter if you do not define one when configuring your connection, since Gopher will ask which server you wish to access. If you do not know, ask your service provider to let you know which is the closest Gopher server to you, or try one of the common Gopher sites predefined within the Gopher application. Select **Well Known Gopher Servers** from the Gopher pull-down menu.

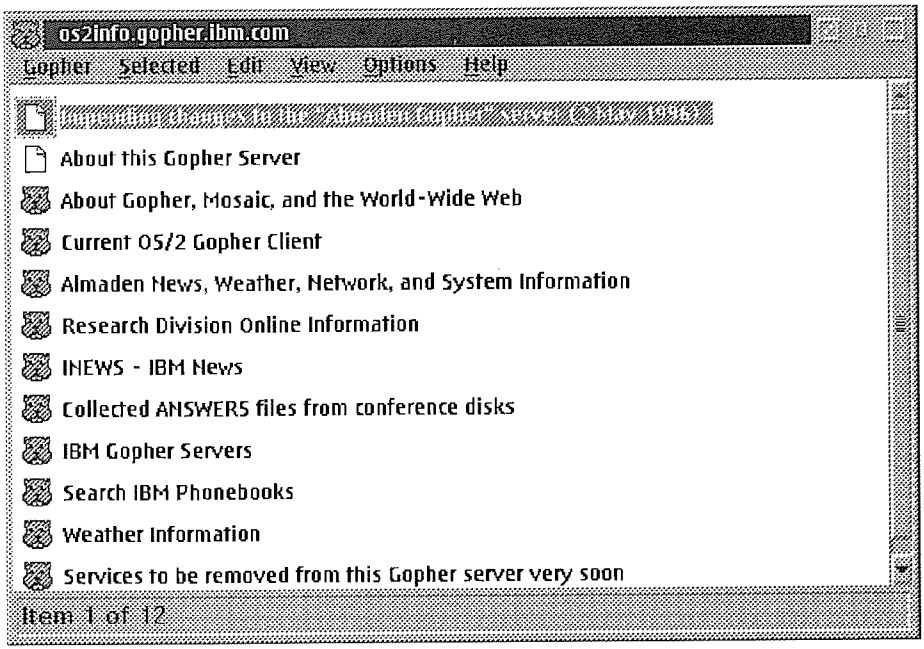


Figure 371. Gopher

5.10.20.2 Using the Gopher

Using Gopher is very much like reading a book. The only drawback is that this book has to be read from page 1 every time, then page 2 and so on, until you arrive at the page you really wanted to get to. There are a lot of pages!

This can quickly become a painful process, so Gopher allows you to save the current page as a bookmark, or alternatively as the home bookmark, in which case this is the page you will see when you first connect to the Internet. You can quickly go straight to a given Gopher page by selecting **Open Bookmark Window**, and selecting the page you require.

In addition to being able to save the current location as a bookmark, you can explicitly specify a location and save it as a bookmark. To do this select the **Specify Gopher Item** under the Gopher pull-down menu. You will be presented with a panel requesting the Gopher location and path. Once completed, you can save this page either as a bookmark or as your new home page.

As you use Gopher, every page you open appears as a separate window. You can access Gopher pages immediately by selecting them from the Open History window, or from the OS/2 Warp 4 Window List.

Some Gopher Sites contain files such as images and sound clips. Gopher allows you to view these, but uses external programs to do so. You will therefore need to install OS/2 Warp 4's multimedia support in order to view such files when running Gopher.

To end your Gopher session, select the **Exit Program** option, which will shut everything down for you. You can also invoke the Exit Program option using the Alt-X key combination; many of the menu options in Gopher can be accessed using hot-keys.

5.10.21 Using TALK and TALKD

The TALK command is used if you want to chat with another TCP/IP user across the network. To be reached by the TALK command, the TALKD daemon must be up and running. The TALKD daemon is either started automatically, when you initiate a talk session (assuming that you want to also receive messages) or can be defined to be launched automatically in the Autostart page of the TCP/IP Configuration notebook. Of course you can start the daemon at any time from a command prompt.

Although the TCP/IP Configuration notebook allows you to launch the TALKD detached, it is better to run TALKD as a foreground session. The reason for this is that when somebody is calling you with TALK, the information that is necessary to respond to this message is displayed in the standard output (stdout) window in which the process is running, and detached applications have no output windows.

5.10.21.1 Initiate a Chat with TALK

To initiate a chat, you must know the machine name and the user ID of the partner you want to reach. If you know that he's working on an OS/2 machine, because there are no user IDs, you can specify USER or OS2USER as the user ID.

The user ID of the caller is set to the value that is defined in the USER environment variable, or if there is no such a variable it is defined to OS2USER.

To finally initiate a call to the user *juergen* on the machine juergen.itsc.austin.ibm.com, go to a command prompt and type:

```
talk juergen@juergen.itsc.austin.ibm.com
```

This will cause the remote machine to ring like a telephone. You can see the number of rings to connect to the remote TALKD daemon machine by the `Checking for invitation on caller's machine` message that is displayed on your machine. If the message is repeated several times, your party may not have the TALKD started, which means to stay with the example of a telephone, that the remote phone is not plugged in.

If you get a `Checking for invitation on caller's machine` message only once and then a `Ringing your party again` message, the remote machine has the TALKD daemon running, and it is ringing (like a telephone).

When it picks up the connection you get `Waiting for your party to respond` messages until a session between both parties is established and finally a `Connection established` message is displayed.

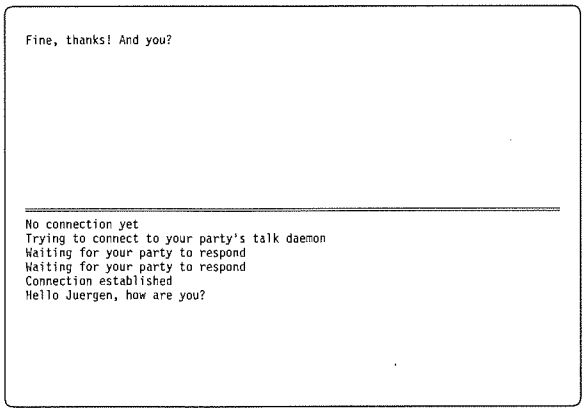


Figure 372. Example of a Talk Screen

The person you are communicating with will now have exactly the same screen as you have. The top half of the screen displays all the messages you have send while the bottom half of the screen shows the messages you received. To stop a connection, press Ctrl+C. Both parties talk clients will be stopped, although the TALKD daemons will still be running.

5.10.21.2 Reply to an On-Line Talk Call

When you have the TALKD daemon running and you hear the ringing from the incoming call, switch to the window that is running the TALKD daemon.

In that window you will see the message of an incoming call. It looks like the following:

```
Message from Talk_Daemon@ausres50 at 18:22 ...
talk: connection requested by os2user@juergen.itsc.austin.ibm.com.
talk: respond with:  talk os2user@juergen.itsc.austin.ibm.com
```

In the first line you see the time stamp when the call was recorded. In the second line you have the user ID and machine name of the caller. The third line gives you the command to pick up this connection. In this example the command to respond to the call is:

```
talk os2user@juergen.itsc.austin.ibm.com
```

The best way to respond to a message is to cut this command to the clipboard and paste it to a command prompt. After this connection is established, the communication can begin as described in 5.10.21.1, "Initiate a Chat with TALK" on page 634.

5.10.22 Sendmail (SMTP)

Sendmail is the base application that is used to send and receive mail using SMTP (Simple Mail Transport Protocol). Sendmail is a client application as well as a server application.

The following sections describe how to configure and use the sendmail applications.

5.10.22.1 Configuring Sendmail

The configuration of sendmail is usually done in the SENDMAIL.CF configuration file, which is stored in the \MPTN\ETC directory. Each e-mail application can use a different sendmail configuration file. Ultimedia Mail/2 Lite client uses the SENDMAIL.UML configuration file instead.

The structure of the SENDMAIL.CF file is very complex. With limited knowledge about that file you should only change the following settings:

OQ Specifies the path to the mail queue. This is the path where sendmail temporarily holds mail before delivering it to the recipient.

Cw Specifies any aliases you may want to designate.

Dw Specifies your host name only.

DD Specifies the local domain name.

> **Note**
>
> It is advisable to use a text editor that preserves TAB characters when editing these files.

If your host is warp4.itsc.austin.ibm.com and the path to the mail queue is c:\mptn\etc\mqueue, you have to change these fields in SENDMAIL.CF as follows:

```
OQC:\MPTN\ETC\MQUEUE
Cwwarp4
Dwwarp4
DDitsc.austin.ibm.com
```

There are several more parameters that can be customized in SENDMAIL.CF. Be very careful with any changes in the SENDMAIL.CF configuration file, since any error may prevent sendmail for sending or receiving any mail.

For a complete overview of the settings in the sendmail file, refer to the OS/2 Warp 4 online documentation.

You should also ensure that the following directories exist in your ETC directory:

MAIL Incoming mail is stored in this directory.
MQUEUE Outgoing mail and temporary files are stored in this directory.

To modify the parameters in the SENDMAIL.CF configuration file, you can also use the TCP/IP Configuration notebook. To do so, please refer to 5.10.8.3, "The Sendmail Configuration Pages" on page 577.

5.10.22.2 Starting Sendmail As a Server

The sendmail server process normally runs permanently in the background to send and receive mail. You can start it from any command prompt or define it to be started whenever TCP/IP is started (when TCPSTART.CMD is executed).

To define sendmail to be autostarted, follow the following procedure:

1. Start the TCP/IP Configuration notebook
2. Select **Autostart**
3. Select **sendmail** from the Services to Autostart list
4. Select the **Autostart service** if sendmail should be started automatically when TCP/IP is started (TCPSTART.CMD is executed)
5. Select **Detached** or **Foreground** session. When **Detached** is selected, the sendmail process does not appear in an OS/2 window and in the task list, such as it does when the Foreground session is selected.
6. Customize the default parameters. The parameters are the same as those for starting sendmail from the command line. These parameters are described in a few paragraphs.
7. Close the TCP/IP Configuration notebook. When you are prompted to autostart sendmail with the default parameters, select **Yes** if you intend to use Ultimedia Mail/2 Lite and **No** if you want to use another mailer.

To start sendmail from a command line, you can type the following parameters:

```
[C:\]sendmail -bd -q30m
IBM OS/2 SENDMAIL VERSION 2.0
Using Sendmail Configuration File C:\MPTN\ETC\sendmail.cf
Sendmail process started
```

The sendmail command has the following parameters:

-bd Starts sendmail as a server.

-qtime Specifies the interval that the mail queue has to be processed. The time is set as a number and a letter. Use the following letters:

- s for seconds
- m for minutes
- h for hours
- d for days
- w for weeks

For example, the command for processing the queued mail every 30 minutes is:

```
sendmail -bd -q30m
```

-Cconfiguration_file Specifies the name and location of the sendmail configuration file used for the sendmail server. If no configuration file is specified, sendmail uses the SENDMAIL.CF configuration file in the ETC directory. For Ultimedia Mail/2 Lite, the SENDMAIL.UML configuration file should be specified.

5.10.22.3 Using the Sendmail Client

Normally you'll never use the sendmail client directly to send your mail, even though it is possible. The sendmail client is mostly used by the e-mail application (such as Ultimedia Mail/2 Lite).

If you want to send e-mail, using the sendmail command directly you have to create a file containing the mail first. This file can then be sent as e-mail to other systems using the sendmail command.

The format to use sendmail is the following:

```
sendmail -Cconfiguration_file -a filename -f user@localhost user@remotehost
```

or

```
sendmail -Cconfiguration_file -a filename -t
```

The parameters used by sendmail are:

-Cconfiguration_file Specifies the path and file name of the sendmail configuration file. SENDMAIL.CF is used by default if this parameter is not specified.

-a filename Specifies the file that contains the e-mail.

-f user@localhost Identifies the user and host name of the sender.

user@remotehost Identifies the user and host name of the receiver.

-t Specifies that sendmail retrieves the addressing and subject information from the heading of the specified file rather than from the command line. Sendmail scans the note for the first occurrence of the following tags:

To:	Specifies the address of the receiver.
From:	Specifies the address of the sender.
BCC:	Specifies the list of addresses for the blind carbon copy.
CC:	Specifies the list of addresses for the carbon copy.
Subject:	Specifies the subject of the e-mail.

Note:

Even though OS/2 is not a multiuser operating system, the user part of the mail (sender and receiver) must be specified. Otherwise, sendmail will not work properly.

5.10.23 Printing in a TCP/IP Environment

OS/2 Warp 4 offers you a variety of TCP/IP print functions. You can print via TCP/IP to a remote host and configure an OS/2 machine very easily to serve as a print server for other hosts in the TCP/IP network. The TCP/IP printing related functions in OS/2 Warp 4 are:

Program	Function
lpd	Line printer daemon
lpr	Line printer requester
lprmon	Line printer monitor
lpq	Line printer query in remote queues
lprm	Line printer remove jobs in remote queues
lprportd	Enables the port objects to use in the Workplace Shell print spooler

These functions allows you to print both text and binary data to most types of printers, including laser, inkjet and conventional line printers.

5.10.23.1 Setting Up a Print Server

Setting up a print server on which other members in the TCP/IP network can print on is very easy. It assumes that you already have a Workplace Shell printer object for your local printer installed and that you are able to print on this printer. All you have to do is to start the line printer daemon (lpd). This can be done from an OS/2 command prompt using the lpd command or if you prefer to start the daemon automatically you select this service in the TCP/IP Configuration notebook on the Austostart page.

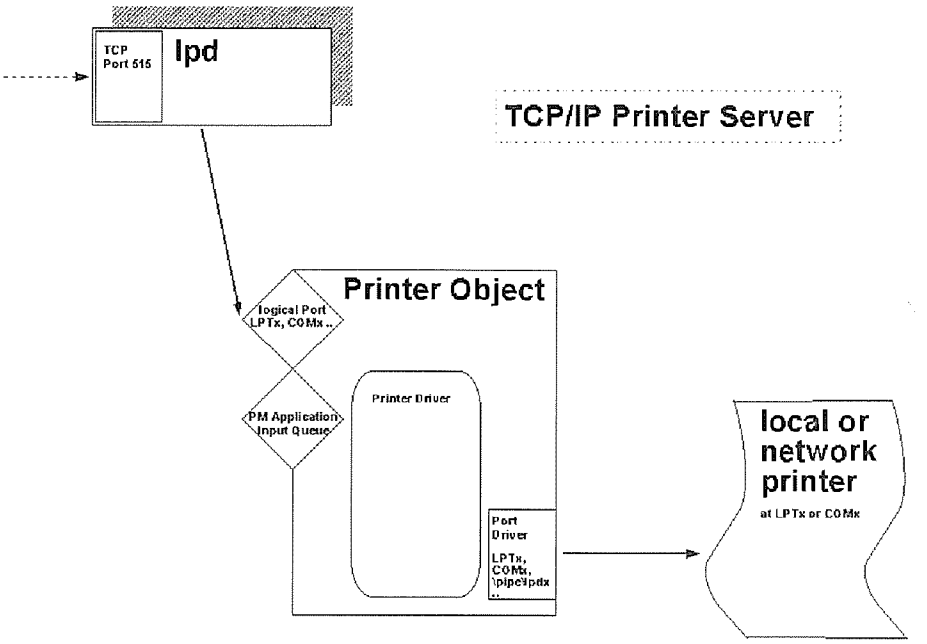


Figure 373. Line Printer Daemon

As long as the lpd is running on your system, other systems in the TCP/IP network can print text and graphics on your printer (see Figure 373 on page 640). To use this service you must first install a printer driver and object on the machine thats going to act as the TCP/IP print server. For more information regarding installing printer objects and drivers refer to Chapter 4, "Printing" on page 229. The lpd service requires this to be present in order to communicate with the print jobs running through the OS/2 Warp 4 spooler. Only one instance of lpd can listen to the well-known TCP/IP port 515. Only one instance of lpd is therefore required to control all of the printers on the server system.

You can change the behavior of lpd service using the options shown in Figure 374.

```
[C:\]lpd -?

Usage: lpd -? | {[-c] [-b [<banner>]] [-s] [-f] [-cp<type>]}

        banner  - Optional file containing
                  the banner to be printed

        Options -
                -?              Display this message
                -c              Do not print control file
                -b [<banner>]   If a <banner> file is supplied,
                                then use that file as the Banner.
                                Otherwise no banner is printed.
                -s              Secure (720 < client_port < 732)
                -f              Default to TEXT file format.
                -cp<type>       Selects codepage translation.

[C:\]
```

Figure 374. Parameter of the lpd Command

The print control file (the -c parameter in the options) contains information about the origin of the current print job. The lpr print command prints this file in addition to the print file.

The -t options of the lpd command changes all print jobs to text format. If you use this option you cannot print any binary data, such as graphics or WYSIWYG documents.

The -b option prints separator pages between print jobs. If this option is specified followed by the name of a banner file, it will generate a separator page that will identify the origin of the print job. If no file name is specified after the -b parameter, the default file banner.lpd located in the \TCPIP\BIN directory will be used. The following keywords can be used when creating your own banner file:

Keyword	Description
%H%	Name of the host that originated the print job
%U%	Name of the user that originated the print job
%J%	Name of the print job
%C%	Class of the print job

The lpd service can be started manually or via the STARTUP.CMD file. To save system resources you can also start lpd as part of the inetd super server by selecting it for autostart in the Autostart page of the TCP/IP Configuration notebook.

5.10.23.2 Remote Printing Using lpr Command

There are different ways to print data to a remote printer. One way is by using the lpr command, which is similar to the PRINT command in OS/2. lpr acts as a launcher to print a printer-ready file such as a plain text or PostScript file on a remote printer.

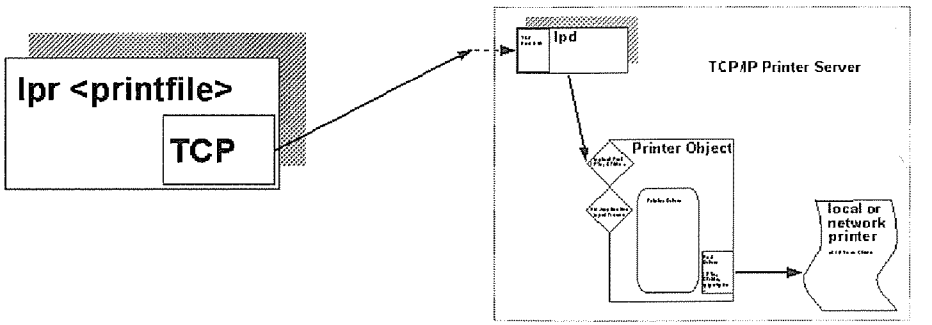


Figure 375. Printing with lpr

To direct a print job to a specific printer, you must define the printer port using the -p parameter and the server running the lpd daemon using the -s parameter. The server can be identified with either its IP address or host name. The -p and -s parameters must be specified for every print job. This can be done manually or by defining a default printer port and server. See Figure 374 on page 641 for a list of print job parameters.

Defining defaults are accomplished by using the environment variable LPR_PRINT and LPR_SERVER. The variables can be set by:

- Using the set command in an OS/2 Window
- Defining them in CONFIG.SYS
- By using the TCP/IP Configuration notebook

  When using this option, the Remote Print Server and Remote Print Server's printer are defined on the Printer page of the Configuration notebook. The environment variables are then automatically defined in the CONFIG.SYS.

```
[C:\]lpr -?
lpr Version 2.0.2 (DLL Version 0.8beta)
Usage:
lpr -?
lpr [-<f|b>] [-h] [-n] [-p <printer>] [-q delay] [-r retry] [-s <server]
    [-t] [-x translate_table] [-X<string>] [-X <string>] filenames

  -?          This help message.
   -b          Send as a binary file.
   -f          Send as a text file (format output through PR).
   -h          nodnshname:  get local host name via gethostname()
               Hostname will NOT be a fully qualified IP name.
   -n          Display error messages only.
   -p          Specify a printer, otherwise LPR_PRINTER is used
               as the printer.
   -q          Specify seconds to wait before next connect attempt.
   -r          Specify number of attempts to connect to server.
   -s          Specify the server, otherwise LPR_SERVER is used
               as the server.
   -t          Enable tracing.
   -x          Specify name of translate table.
   -X<string>  Specify an additional control card for the control
   -X <string> file, where X is any character which does not
               indicate a valid lpr option and <string> is any
               combination of characters.

[C:\]
```

Figure 376. lpr Command

5.10.23.3 Remote Printing Using lprmon

The Line Printer Monitor (lprmon) functions very differently from the lpr command. Once started, lprmon is a process that runs in the background monitoring a specified LPTx port. All print jobs sent to this port will be automatically redirected to an lpd server somewhere in the network. (See Figure 377.)

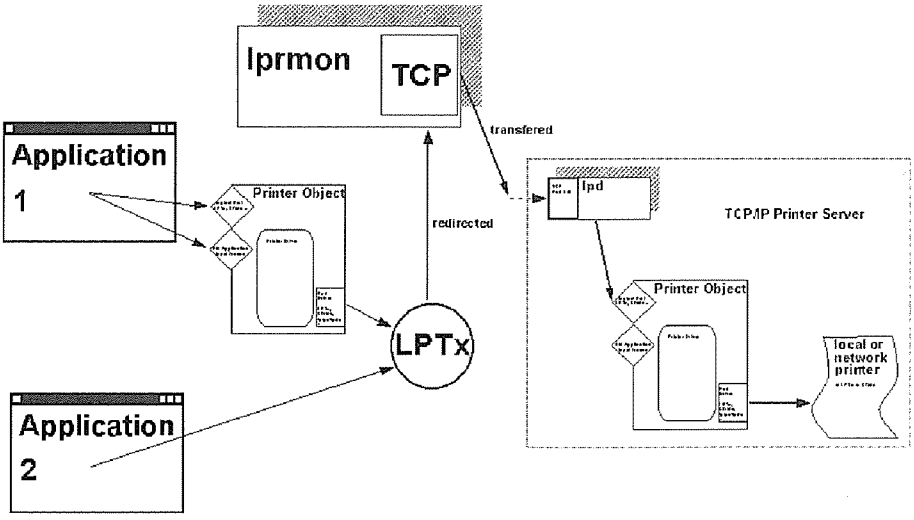


Figure 377. Remote Printing Using lprmon. lprmon redirects the data from the specified LPT device to the lpd on a remote host. Application 2 is, for example, a DOS program, that prints directly to LPT1. Application 1 is a PM application that prints to a queue that is assigned to LPT1.

Similar to the lpr command, lprmon addresses the remote printer via the IP address or host name of the server running lpd. Further, lprmon must also know what local port it has to redirect and therefore the following information is needed:

- IP address or host name of the remote host (printer server)
- Device name of the printer port on the remote host (LPTx, COMx)
- Local parallel port to redirect

If you want to redirect more than one local parallel port, you must start an lprmon process for each port.

```
[C:\]lprmon -?

Usage:
  lprmon -?
  lprmon [-{f|b}] [-r<retries>] [-q<delay>] [-p<printer>]
         [-s<server>] [-cp<type>]<device>

        device  - Parallel port to monitor
                  User should specify lpt<n>
                  Where n = 1..m

        Options -
                -?          Display this message
                -b          Send as Binary File to the server
                -f          Notify server to format output through PR
                -n          Disable beep when errors displayed
                -r<retries> Sets the number of retries
                            Default = 3 retries
                -q<delay>   Sets retry delay in seconds
                            Default = 10 seconds
                -p<printer> Specifies Printer device name on the server
                            Defaults to the LPR_PRINTER environment variable
                -s<server>  Specifies Printer server
                            Defaults to the LPR_SERVER environment variable
                -cp<type>   Selects codepage translation.

[C:\]
```

Figure 378. lprmon Command

As for the lpr command, if you do not specify the server with the -s option or the remote printer port with the -p option, lprmon will use the environment variables LPR_SERVER and LPR_PRINTER. These can be specified in the CONFIG.SYS or in the TCP/IP Configuration notebook in the Printing page.

5.10.23.4 Remote Printing Using the lprportd

The Line Printer Port Daemon (lprportd) works similar to the lprmon command. Once that lprportd has started, it enables the use of the \pipe\lpdx port drivers. These drivers can be specified in the printer object settings (see Figure 380 on page 647). If you have created a printer object that uses the \pipe\lpdxport driver, you can only print from an OS/2 PM application and not from a DOS or Windows program. This is because the printer object that lprportd monitors has no LPT port assigned and you should use lprmon if you want to print non-PM-based applications.

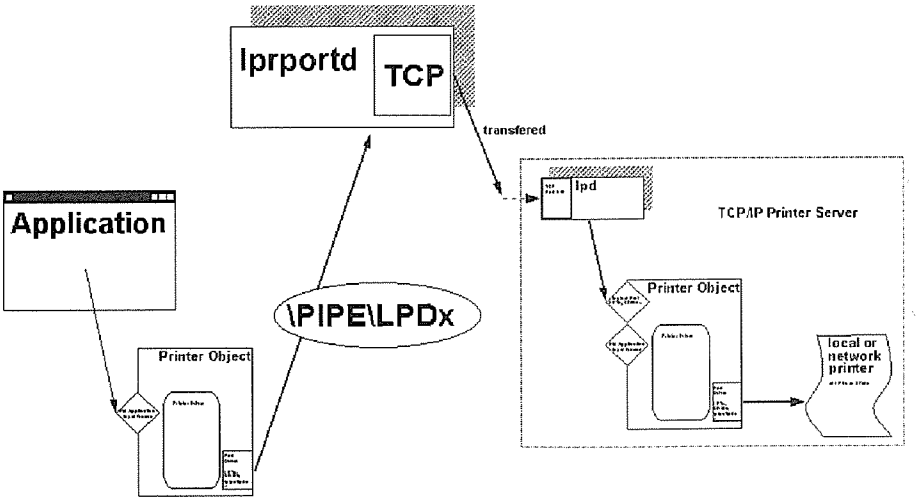


Figure 379. Remote Printing Using lprportd

The remote address and the remote printer port is specified when you define the printer object for remote printing. You have to select the correct port driver. In our case, we do not want to direct this queue to LPT1, but rather to a remote lpd daemon. To do this we have to select the **Output Port** page in the printer object's Properties notebook and select a \PIPE\lpdx object that we want to use. It doesn't matter which object we choose and it is not printer specific. These objects are the beginning of a pipe to a line printer daemon on a remote host. If you open the Properties notebook of the selected output port object, you can specify the address of the remote host (either IP address or host name), and the printer port on the remote host (see Figure 380).

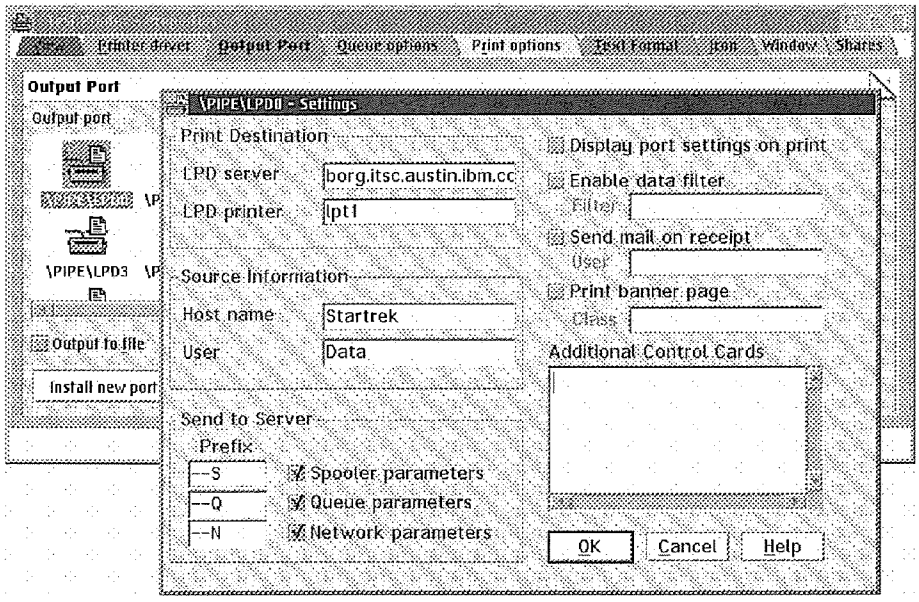


Figure 380. Configuring the \pipe\lpd Port

The default number of queues are 8 (from \pipe\lpd0 to \pipe\lpd7). If you want to change the number, you can do it *only* in the TCP/IP Configuration notebook in the Printing page. This information is stored in the OS2SYS.INI file and the TCP/IP configuration process does that for you.

```
[C:\]lprportd -?
lprportd Version 2.0.6Beta
usage: lprportd [-?] [-d] [-i idle_delay] [-q delay] [-r retry] [-t] [-n]

lprportd allows you to redirect your Workplace Shell
printer icons to remote lpd printers.  lprportd needs to
be started only once, even if multiple printer icons are
redirected, but it must be running before print jobs are
submitted to redirected printer icons.

Options:
   -?   display this help message
   -d   do not delete the spool file
   -i   minutes pipe remains idle after all retry attempts fail.
   -q   seconds to wait before retry (failed connect to server).
   -r   number of attempts to connect to server.
   -t   trace
   -n   nodnshname:  get local host name via gethostname()
           Hostname will NOT be a fully qualified IP name.
Defaults: [-i 15] [-q 180] [-r 5]

[C:\]
```

Figure 381. lprportd Command

The lprportd service can be configured to start automatically in the TCP/IP Configuration notebook.

5.10.23.5 Querying a Printer Queue with lpq

You have the capability to check whether your print job is still in the queue or whether it has already been printed. You can query the remote queue by using the lpq command. Similar to the lpr command, you have to specify the remote host address (IP address or host name) and the port that the remote printer is attached to.

```
[C:\]lpq -s ausres50 -p lpt1

JobID  File Name          Rank      Size        Status          Comment
-----  ---------------    ------    --------    ------------    ------------
   37  CONFIG.SYS              1      5613    Queued          System
   38  00276490.SCR            2    556565    Queued          System
   39  00276490.SCR            3    128068    Queued          System
   40  002764B0.SCR            4    122145    Queued          System
   41  00276C50.SCR            5     91806    Queued          System
   42  AUTOEXEC.BAK            6       387    Queued          System
   43  AUTOEXEC.BAT            7       388    Queued          System
   44  boot.dat                8      1821    Queued          System
   45  BVHVGA.DLL              9      1430    Queued          System
   46  C                      10       128    Queued          System
   47  CDBOOT.EXE             11      1107    Queued          System
   48  config.000             12      6170    Queued          System
   49  Config.860             13      4401    Queued          System
   50  CONFIG.BAK             14      5518    Queued          System
   51  CONFIG.BK1             15      5541    Queued          System
   52  CONFIG.MPT             16      5681    Queued          System
   53  <untitled>             17         0    Spooling        System

[C:\]
```

Figure 382. Displaying a Remote Printer Queue with lpq

If you do not specify the server address with the -s option and the remote printer port with the -p address, lpq will use the environment variables LPR_SERVER and LPR_PRINTER that can be specified in the CONFIG.SYS or in the TCP/IP Configuration notebook in the Printing page.

```
[C:\]lpq -?

Usage: lpq -? | {[-l] [-p<printer>] [-s<server>] [<joblist>]}

        joblist - A list of job identifiers to display.
                  If omitted, all jobs are returned

        Options -
                -?          Display this message
                -l          Request Long output from server
                -p<printer> Specifies Printer device name on the server
                            Defaults to the LPR_PRINTER environment variable
                -s<server>  Specifies Printer server
                            Defaults to the LPR_SERVER environment variable

[C:\]
```

5.10.23.6 Deleting Jobs from a Printer Queue with lprm

You can delete print jobs from a remote queue with the lprm command. To do so, you have to query the remote queue first, to receive the job id of the print job that you want to use (see Figure 382 on page 649).

To delete a job from the queue you have to specify its job id, the address of the remote host and the remote printer port. For example:

```
lprm 45 -a Rob@ausres49 -s ausres50 -p lpt1
```

If you do not want to specify the remote host address, you can define the LPR_SERVER and LPR_PRINTER environment variables as explained in prior sections. In addition you can also define the USER environment variable, so that you do not have to specify your user name with the -a option.

Note

You can delete *every* print job in the remote queue, whether you are the owner of the job or not.

5.10.24 PING

PING (Packet InterNet Groper) is one of the basic TCP/IP commands. It is based on the ICMP (Internet Control Message Protocol). ICMP was originally an error-reporting mechanism because it is a low level protocol and it only reports errors to the original source. The source must itself relate individual errors to the applications that generated them.

The ICMP messages used by the PING command are *echo request* and *echo reply*. When a host issues an echo request ICMP command and the ICMP protocol on the target host receives this request, it will send back an echo reply message to the origin of the request. This process is completely handled by the ICMP protocol. The target host does not have to run a server to reply to a PING request.

The PING command is used to check if a specified host can be reached and, if successful, what the response time was.

```
[C:\]ping -?
Usage: ping [-?drv] <host> [size [packets]]

Where:
d       - Turn debug on.
r       - Bypass the normal routing tables.
v       - Verbose output.  Include all ICMP packets received.
host    - Destination.
size    - The size of data portion of the packet.
packets - The number of Echo Request packets to send.

[C:\]
```

Figure 383. The PING Command

If you specify the PING command with the target host address, the process will continue until you stop it with a Ctrl+Break key sequence. You are then presented with some statistical information similar to the following:

```
----9.164.197.94 PING Statistics----
6 packets transmitted, 6 packets received, 0% packet loss
round-trip (ms)  min/avg/max = 440/666/780
```

If you want to check the connection with a specific package size, you can define this in the PING command. This is done using the size and packets parameters and is specifies after the host address. The size is specified in bytes and can be up to 18000 bytes. To send only a limited number of packages, specify it after the size parameter.

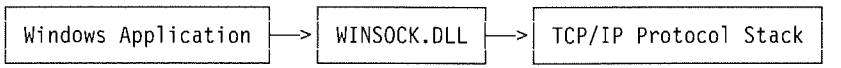
Use the -r parameter to check if a specific host can be reached without using a router.

The PING command is very useful for troubleshooting. If you cannot connect to a host, try to ping it first. If it is unsuccessful, try to ping your default router or name server. If this is also unsuccessful, you may be using the wrong router, the wrong name server or subnetmask. There could also be a physical problem with a cable, or a router could be down due to a power failure, etc.

5.10.25 WinSOCK Support

Many Windows applications use WinSock as a standard interface for Internet applications. Today There are many Windows applications available that rely on the WinSock API. For this reason it was decided to include WinSock support in the Win-OS/2 environment in OS/2 Warp 4.

A Windows or DOS application running in a Virtual DOS Machine (VDM) of OS/2 Warp 4 does not have to use the WinSock, but can also use the normal TCP/IP APIs. The WINSOCK.DLL itself is a real TCP/IP application based on the TCP/IP protocol.



5.10.26 Routing

Routers are a main part of the Internet and of an IP network. They are responsible for making sure that a transmitted IP package finds its way to the addressed host through all the different networks. If the router logic is good, it will find the most efficient or quickest way through the network to the remote host. If a part of the network is down, it will attempt to find an alternative paths to the remote host.

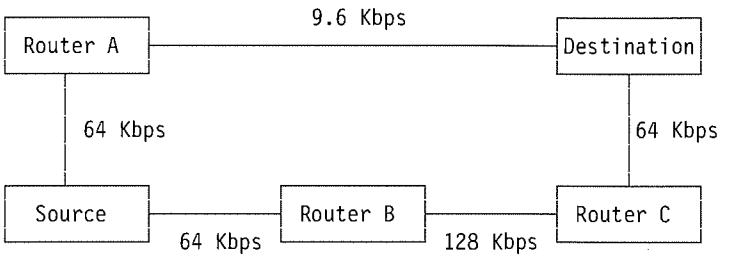


Figure 384. IP Router

Historically, routers have also been called gateways. Gateways are normally used to connect networks using different protocols, such as SNA and TCP/IP together. However, routers only connect two networks using the same protocol, such as an IP router on the Internet.

There are two different types of routing:

- Static

  This form of routing works on the principle that the route to any IP address is fixed and is defined in a routing table. Whenever this route fails, no IP packages can be sent. Static routing does not require the routers to communicate with each other and is therefore easy to set up. They have the advantage that the flow of data can be controlled.

- Dynamic

  This type of routing uses the best path available and learns as it executes. Dynamic routing is much less susceptible to a route being down or missing, because it will simply find the next best route available.

  Dynamic routing works on the principle that the router compares the number of hops (numbers of routers) that a package has to cross before it reaches its target. This

algorithm is used to obtain the shortest route to a destination, for example, the least number of hops.

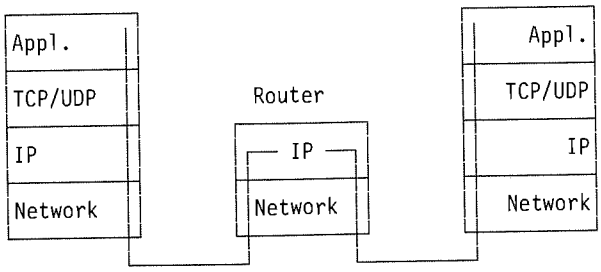


Figure 385. Router

It you look at the example in Figure 385 on page 653 you can see that the shortest route is not always the fastest. Even though the longer route has one more hop, it does not go through the slow 9.6 Kbps connection. For this reason, there is another router protocol that is based on the actual transmission time that it takes an IP package to reach its destination.

The router protocols are:

- RIP

  This is a simple dynamic routing protocol based on the number of hops that an IP package needs to be transmitted to the target. The maximum number of hops is 15. If the destination could not be reached within 15 hops, the destination host is considered as unreachable. The router tables are updated every 30 seconds. RIP is implemented in the routed server in OS/2 Warp 4.

- OSPF

  This is a more complex routing, based on the transmission time to reach the target hosts. OSPF is not implemented in OS/2 Warp 4

- Hello

  This protocol was widely used during the experimentation days of the Internet and in the NSFNET. This protocol has largely been replaced by other protocols.

- IS-IS

  The system-to-intermediate system protocol is similar to OSPF. It is an OSI (open system interconnection) protocol and is not widely implemented yet.

5.10.27 The WebExplorer

Although the Internet is a *physical* network, many people use the term "Internet" when they are really referring to the World Wide Web. The Web is actually a *virtual* network consisting of links between different types of Internet resources. The World Wide Web, or simply the Web, is by far the most popular aspect of the Internet, since it presents information in an easy-to-read, graphical format in documents known as Web pages.

5.10.27.1 Universal Resource Locators (URLs)

Within the Web, each Web page has its own address, known as a *Universal Resource Locator* (*URL*). A URL is composed of three parts:

1. The type of server on which the Web page resides (for example HTTP, FTP, FILE, NEWS, etc.)
2. The domain name of the server (a server can also be described using its IP address, but this is unusual)
3. The location of the Web page on the server

Let's look at some examples. The following URL refers to the IBM Software Home Page, which is an HTML document:

```
http://www.software.ibm.com/index.html
```

This URL refers to a Web page in the file index.html, which resides on a server named www.software.ibm.com, and is accessed using the HTTP protocol.

Most servers on the Web have a default Web page that is automatically loaded whenever a user accesses the server. In the example above, it is possible to omit the file name index.html and the file would be loaded automatically because it contains the default Web page for this server.

Depending on the server to which you are connecting, the default page might be called index.htm (this might be the case on a server using the FAT file system, which only permits three-character extensions for file names). It is for reasons like these that automatic loading of the default page becomes even more useful.

The next example is a URL that points to a very popular OS/2 FTP site in Germany:

```
ftp://ftp.leo.org/pub/comp/os/os2
```

In this case the URL means: go to the FTP server ftp.leo.org, and change to the directory /pub/comp/os/os2 on that server.

A Web page may contain links to other pages on other servers. When the author of a Web page sets up the page, he or she can include hyperlinks (often simply called links). These allow you to click your mouse on a picture or a highlighted text phrase, and immediately jump to another page anywhere on the Web. For example, you might be

reading a page on a server in the USA and click on a link, which will send you immediately to another page in Europe or Africa.

You can also activate links using the Links pull-down menu. This menu is new in OS/2 Warp 4, and permits you to navigate through the Internet by voice. The speech recognition software included in OS/2 Warp 4 always looks through the pull-down menus of any activated program and learns all the menu items so that they can be activated by voice.

If you find an interesting page you can save the URL for it, allowing you to return to it easily later. The WebExplorer provides a number of ways to do this, each of which is described in 5.10.27.4, "Storing Frequently Used URLs" on page 658.

5.10.27.2 Configuring the WebExplorer

When you first start the WebExplorer, you will see a window similar to that shown in Figure 386 on page 655.

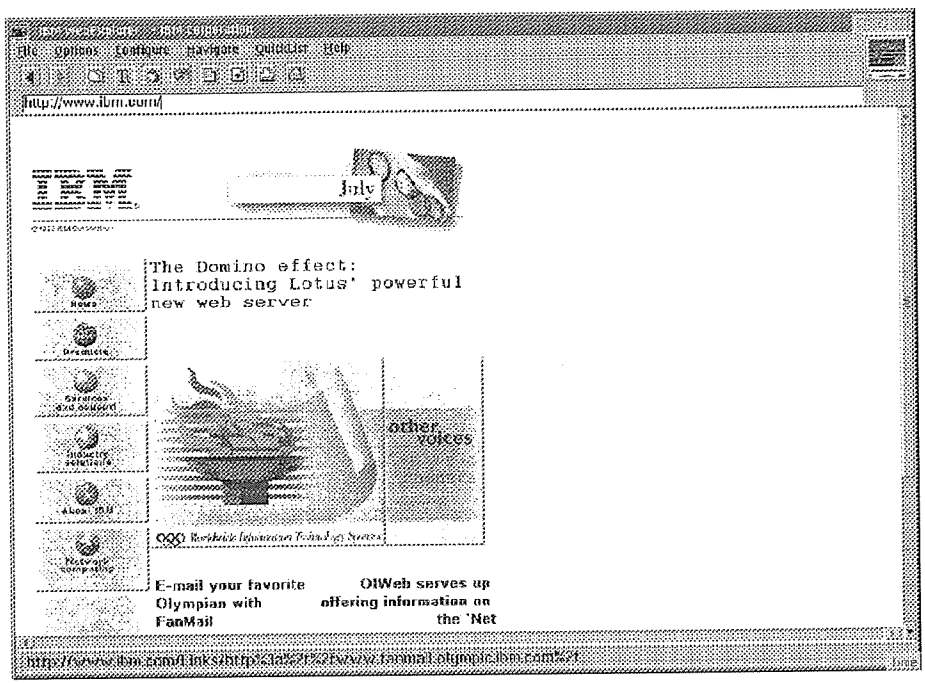


Figure 386. WebExplorer

The example in Figure 386 shows the Web page at URL http://www.ibm.com/. The Web page you see when you start the WebExplorer may be different from this page,

since each Internet user can configure his or her own default page. Other Internet browser suppliers may set their browsers to point to their specific pages.

The WebExplorer includes many useful features. Some of these are not enabled by default but you can enable them using the menu bar in the WebExplorer window. One such feature shows the current URL on the line below the tool bar. The line is actually an entry field and you can enter a new URL in this field, press Enter and be directly connected to that URL. To activate this line, select the **Options** menu from the WebExplorer menu bar, and then select the **Show current URL** menu item.

Another useful feature is the ability to display pictures stored in GIF format while they are being loaded. Using this feature, you can decide whether you want to wait for the entire picture to load, or cancel loading and proceed to another Web page. If you have a relatively slow link to the Internet, this feature can save you a lot of time.

Some GIF files are stored in an *interlaced* format, which allows WebExplorer to display them in such a way that the picture appears first as a rather blurred image which then becomes more clear as the download progresses. This allows you to decide whether you want to continue loading a picture, or skip it and do something else. To implement this feature, select the **Loading...** option from the Configure pull-down menu. In the dialog box that appear, select **Smeared** (see Figure 387 on page 656).

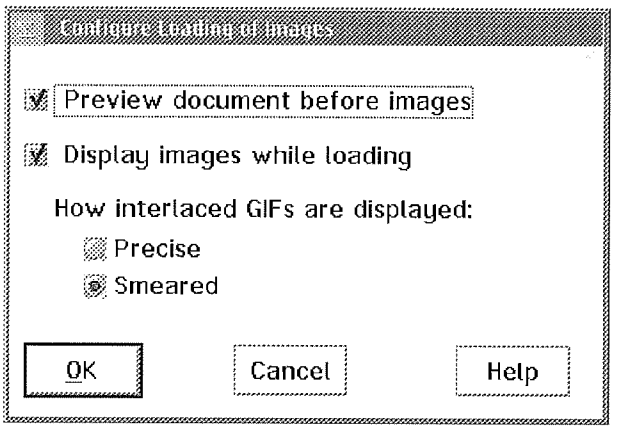


Figure 387. Smeared Loading of GIF Files

Note that the Smeared option only works for GIF files that have been stored on the Web server in interlaced format. This is determined by the person who scanned and stored the picture in the first place. You are therefore likely to see some pictures appear in a smeared manner, while others will simply appear in the normal way.

5.10.27.3 Finding the Web Page You Want

One of the most common problems with the World Wide Web is the sheer volume of information that is available. It can be difficult to find the Web page that you are looking for. Fortunately, a number of organizations on the Web provides *search engines*, which allow you to find URLs for Web pages that deal with particular subjects. Some popular search engines are:

- www.yahoo.com
- webcrawler.com
- www.altavista.com

These search engines store Web pages according to subject categories. You can use their menu-structured Web pages to browse the subject categories that you want, or enter a series of search keywords and have the search engines present you with a list of matching Web pages. For example, if you are interested in automobiles, just type the keyword `automobiles` in the search field and start the engine (see Figure 388 on page 657).

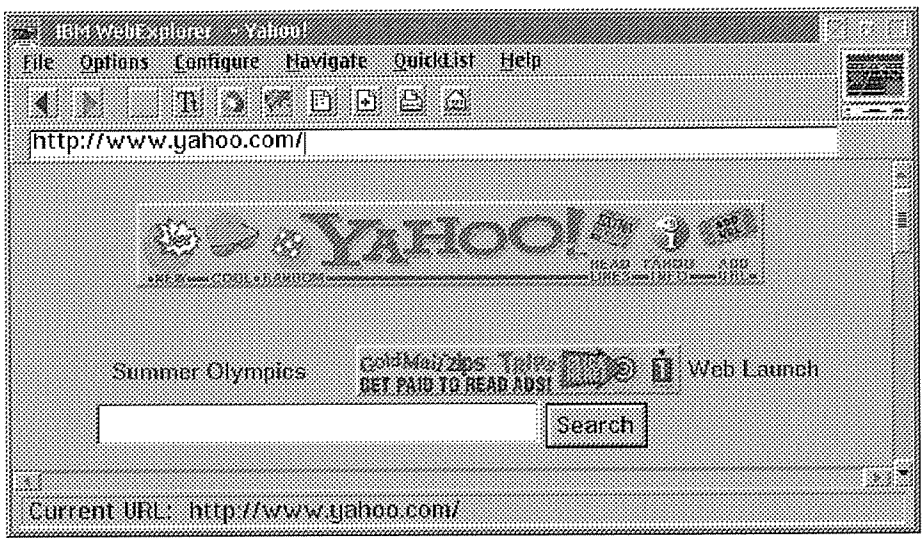


Figure 388. Yahoo Search Engine

The search engine will present you with a Web page showing the titles and/or URLs of pages that match your search criteria. You can go directly to one of these pages by selecting the page with your mouse in the WebExplorer window. Note that any Web page may include links to other pages that deal with the same or related subjects, so tracking down information on a particular subject can take you to various Web sites anywhere in the world.

5.10.27.4 Storing Frequently Used URLs

After you have completed a search and you have found the Web page you were looking for, you can save the page's URL so that you can return to the page quickly the next time you need to access it. The WebExplorer provides you with two ways to do this:

- You can use the URL objects and URL folders that are built into the OS/2 Warp 4 Workplace Shell
- You can use the QuickList within the WebExplorer

Each of these methods has its advantages, and are explained below.

The most versatile way to store URLs in your OS/2 Warp 4 system is to create URL objects on your Workplace Shell desktop, or in a URL folder, which is a special type of folder that you can create. Figure 389 on page 658 shows the Web Sites folder that is automatically created when you install OS/2 Warp 4 and the Internet networking components.

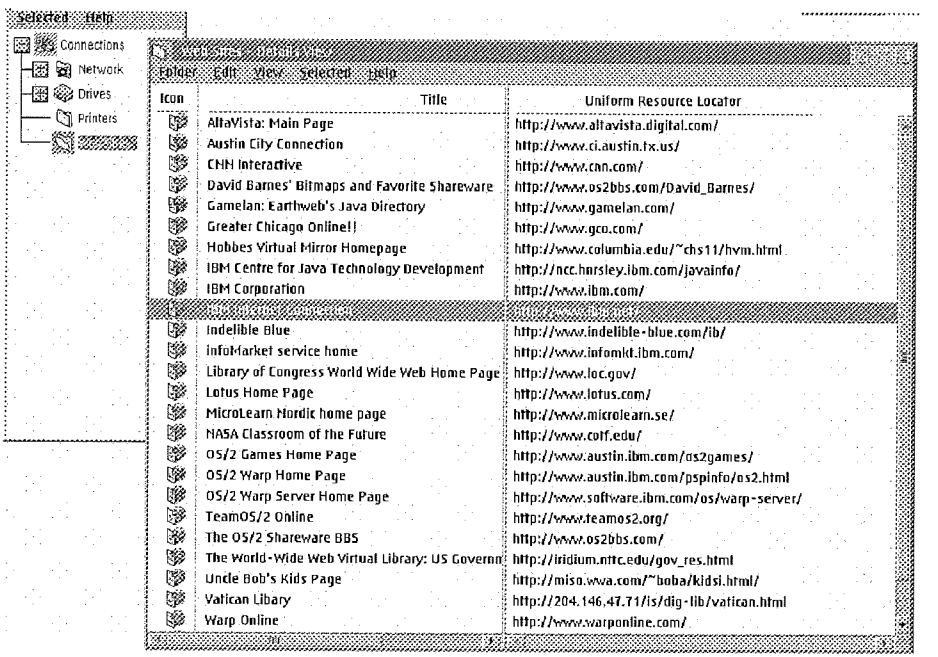


Figure 389. URL Folder

A URL folder contains URL objects that represent the Web pages that are stored. The Web Sites folder contains many interesting URL objects, and you can add more objects, or create your own URL folders containing URL objects. To add a URL object to a URL folder, you can use one of two methods:

- If you already have the Web page displayed in the WebExplorer window, simply drag a part of the text from the Web page over the URL folder, and drop it, as shown in Figure 390.

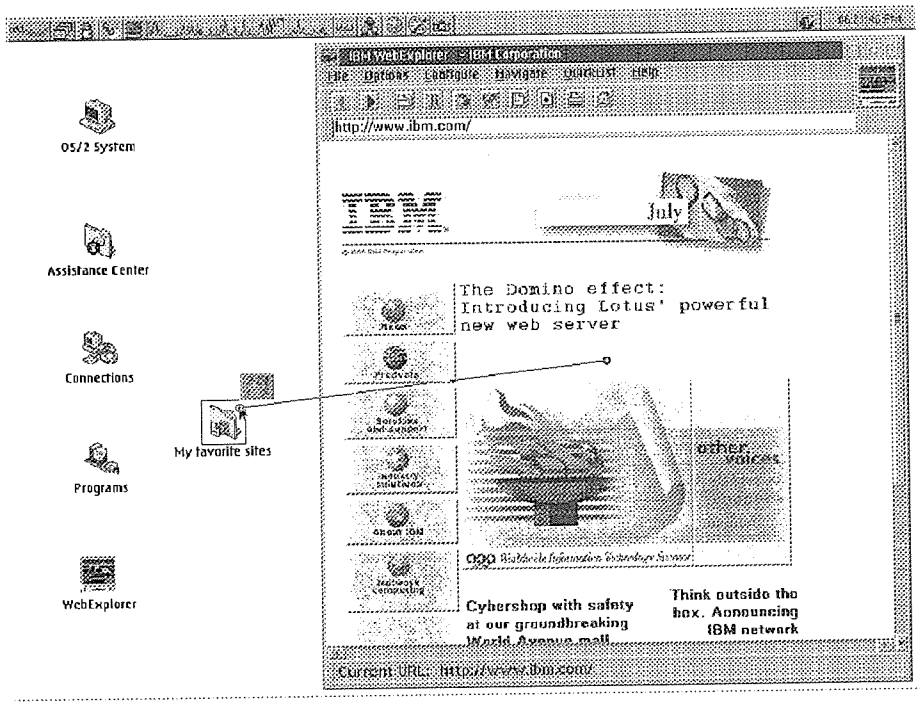


Figure 390. Creating an URL Object from a Loaded Web Page

You should not drag a picture from the Web page, because OS/2 Warp 4 will then copy the picture file to the URL folder, rather than creating a URL object.

- If you are not currently connected to the Internet or you do not have the Web page loaded in the WebExplorer, you can use a template to create a URL object. When you drag and drop the template to your desktop or a URL folder, OS/2 Warp 4 will create an URL object and immediately open the Properties notebook so that you can enter the title and URL manually.

The result of the drag and drop operation shown in Figure 390 on page 659 can be seen in Figure 391.

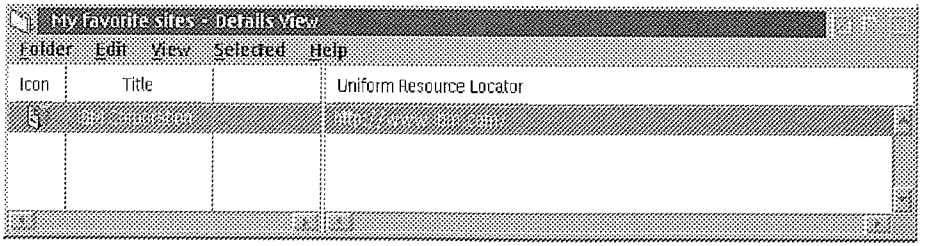


Figure 391. URL Folder with a New URL Object

You can see the way in which a URL object is displayed in a URL folder. The folder shows the title of the Web page as well as its URL.

If you want to access the Web page to which a URL object refers, simply double-click your left mouse button on the URL object. OS/2 Warp 4 will launch a new WebExplorer window, connect to the URL and display the Web page. If you already have a WebExplorer window started, you can drag and drop the URL object onto the WebExplorer window, and the WebExplorer will switch to that URL.

There are several advantages to using URL objects to store your Web pages:

- Since you may collect hundreds of URLs after you have been using the Internet for a while, you can use URL folders to organize your stored URLs so that it is easy to find the URL that you want.
- You can position a URL object wherever you need it. For example, you can place the page with the movie program of your movie theater in your Private Stuff folder.
- If you want to give a URL to another user, you can copy a URL object to diskette, or place it in a network directory. This makes it very easy to share your URLs with others.
- A WebExplorer window launched from a URL object always has the default settings that you have defined for it.

Note that you can place URL folders inside other URL folders or in ordinary folders. In this way, you can create an organized, hierarchical set of folders to store your URLs, instead of having a long unstructured list.

If you wish, you can place URL objects directly into ordinary folders, but you will only see the title of the Web page, not its URL. However, this ability to place URL objects in any folder allows you to group related Workplace Shell objects together. For example, if you are doing a project on Eastern Europe, you could place your word-processing documents, picture files and URL objects in a single folder, thereby grouping all your information neatly in one place.

Another method to store URLs is by using the WebExplorer's QuickList.

While URL folders and URL objects provide a very powerful way to store and organize URLs, using them can be somewhat slow since you need to locate the right URL folder and then drag and drop the URL over the folder. If you have a complex hierarchy of URL folders, this can become quite cumbersome.

If you want a mechanism to quickly place a *bookmark* so that you can return to a Web page at a later time, you can save the URL in WebExplorer's own QuickList. This is done by clicking the button in the WebExplorers toolbar or the **Add current document** item in the QuickList pull-down menu. The URL you are currently viewing will then be stored in WebExplorer's configuration file.

To reload this document at a later time, just click on the button, or select the **More/Edit...** item in the QuickList pull-down menu. WebExplorer will display a dialog box like that shown in Figure 392 on page 661, showing all the URLs you have stored in this way.

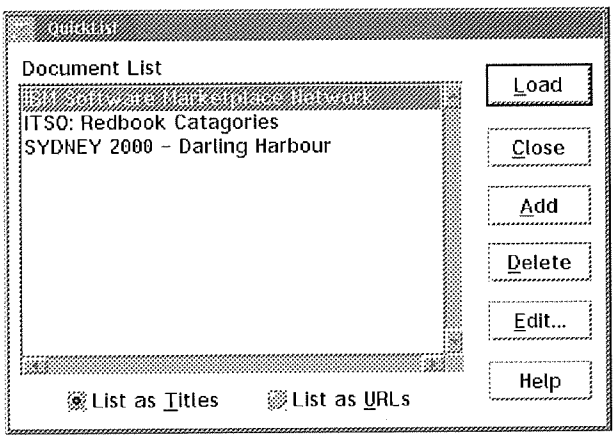


Figure 392. QuickList of Stored URLs in the WebExplorer

Note that while the QuickList provides a quick means of storing a URL, it is an unstructured list (each new item is simply added at the bottom of the list) and can therefore be quite unwieldy for storing large numbers of URLs. We recommend that you use URL objects and URL folders to store most of your URLs, and only use the QuickList for items that you use very often (such as search engines) or to place temporary *bookmarks*.

5.10.27.5 Saving Files from the World Wide Web

While URL objects allow you to save the location of a Web page and return to it later, they do not save the contents of the Web page. In some cases, you may want to refer

to information from the World Wide Web, while you are not connected to the Internet. OS/2 Warp 4 allows you to save information from the Web on your own computer.

Sometimes it is necessary to copy an HTML document to your own hard disk instead of creating a URL object. You can do this in a way very similar to creating a URL object. However, when you drag and drop the document into a folder, press and hold down the Ctrl key while you drop the document. Instead of creating the URL object, OS/2 Warp 4 will create a data file containing the desired document.

Remember, however, that a document displayed in the WebExplorer may consist of different parts such as the main text, embedded pictures and other links. The method described above copies only the text portion of the document. The text document is stored as an HTML document and can therefore only be read with the WebExplorer or other HTML-capable word processor. Imbedded pictures must be copied separately.

If you want to save pictures you must point your mouse at a picture on a Web page and drag and drop the picture into the desktop or a folder on the Workplace Shell desktop. OS/2 Warp 4 automatically copies the picture to the folder. Dragging a picture does not create a URL object, and it is therefore not necessary to press and hold the Ctrl key.

If you later wish to edit the picture file, you can double-click your mouse on the picture icon to launch OS/2 Warp 4's Picture Editor utility. See Chapter 6, "Multimedia Applications and Utilities" on page 683 for more information on this utility.

There are different ways to download other types of files. Web pages often contain links to other resources on the Internet. You can recognize those links in the WebExplorer window, because the text representing them is displayed in a different color (blue by default). A link may point to another HTML document, a binary file, FTP site, Telnet session, etc.

If the WebExplorer knows how to display a document or file, it will display it. For example, if it needs to launch the Telnet client, WebExplorer will do so. In this way, you can view many different types of Internet sites from within WebExplorer.

In some cases, however, WebExplorer will not know what to do with a file. For example, the file may be a program or an archived collection of files. In such cases, WebExplorer will ask you where to download the document to by presenting you with a dialog box as shown in Figure 393.

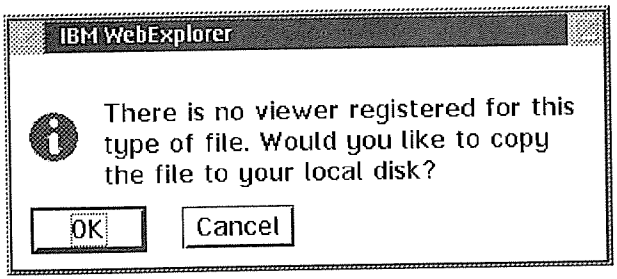


Figure 393. WebExplorer - Handling Unknown File Formats

If you select **Yes**, the WebExplorer will display a file dialog box asking you where you want to store the file.

5.10.27.6 Stopping a Download

Sometimes a Web page, picture or data file can be very large. If you decide that you do not want to wait for the complete file to be downloaded, you can click on the large icon at the top right of the WebExplorer window to stop loading the document. You can also perform the same operation by pressing the ESC key.

If you accidentally stop a document loading, and then want to continue, you can reload it by pressing the F5 key. This will automatically reload the current Web page and any graphic files within the page.

5.10.27.7 Defining New Viewers

The WebExplorer has a certain knowledge of which types of documents exist on the Web and how to view them. Sometimes it is necessary to change the viewer for a specific document type. You might have a newer or updated viewer for a specific type of file. This changes can be done by clicking on the **Viewers...** item in the Configure pull-down menu.

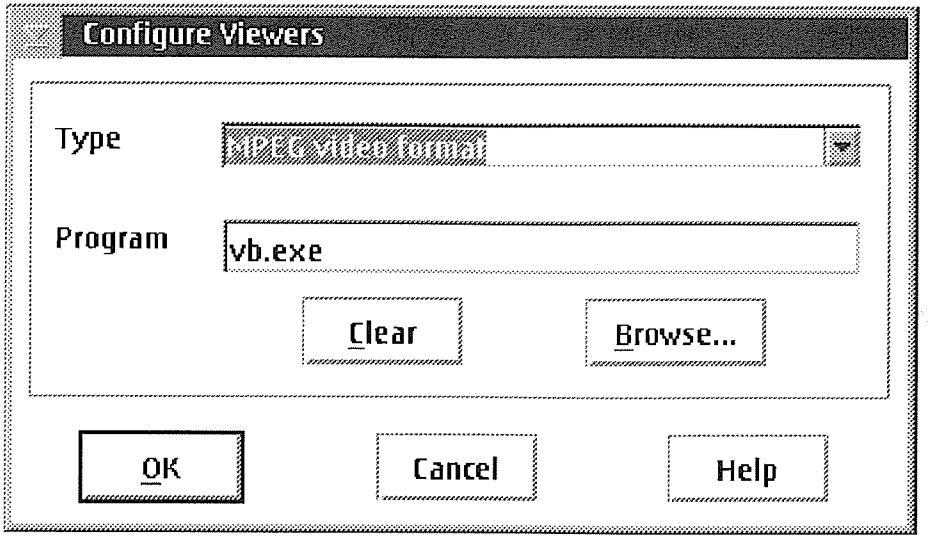


Figure 394. Configure Viewers in WebExplorer

The dialog box that appears is shown in Figure 394 on page 664. In the first entry field you select the type of the data file, and in the second field you specify the name of the viewer to be used.

5.10.28 Netscape Navigator for OS/2

Although OS/2 Warp 4 ships with the WebExplorer built into the package, you will notice an icon on your desktop called Get Netscape Navigator. The reason for this is that shortly after the release of OS/2 Warp 4 a native version of the Netscape Navigator for OS/2 will be available and you can use this icon to download a free copy of the Netscape Navigator for OS/2.

Netscape Navigator is the most popular Web browser available today and it supports HTML 3.0, frames and Java. These features make it one the most desired browsers in the industry. See Figure 395 for a graphical presentation of Netscape Navigator for OS/2.

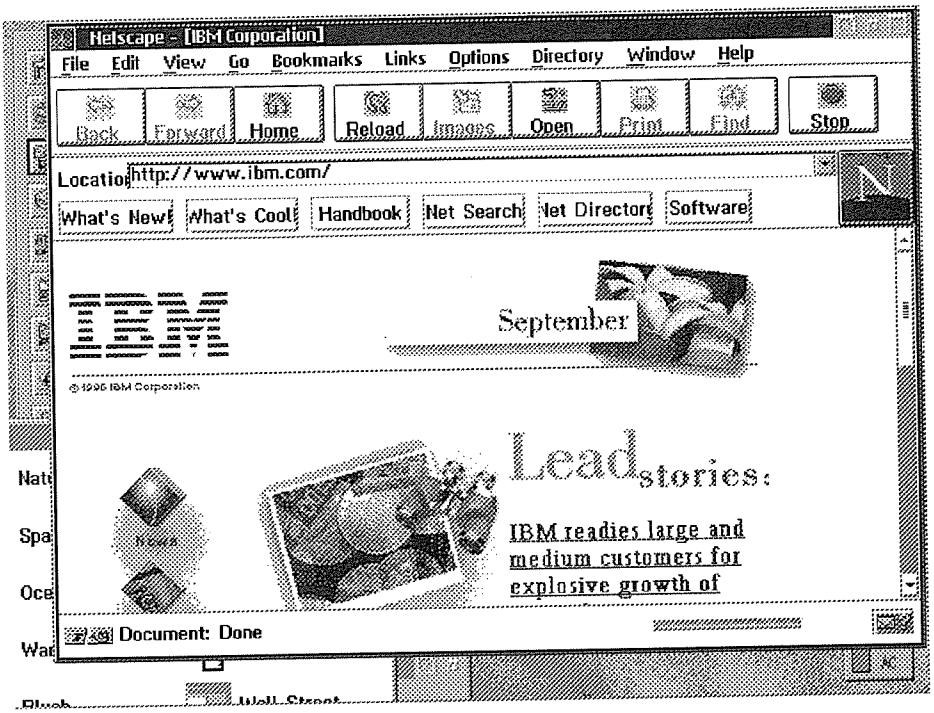


Figure 395. Netscape Navigator for OS/2

5.10.29 Running Java Applications

One of the new features in OS/2 Warp 4 is the ability to run Java applications. Support for running Java applications is installed automatically when you install OS/2 Warp 4. If you want to develop your own Java applications, you have to install the Java Developer Kit (JDK) during the installation process of OS/2 Warp 4. The JDK is not necessary to run Java applications.

Java is an object-oriented language that was developed in the 1990s. One of the goals of Java is to be a programming language similar to C++ but easier to use for developing simpler applications.

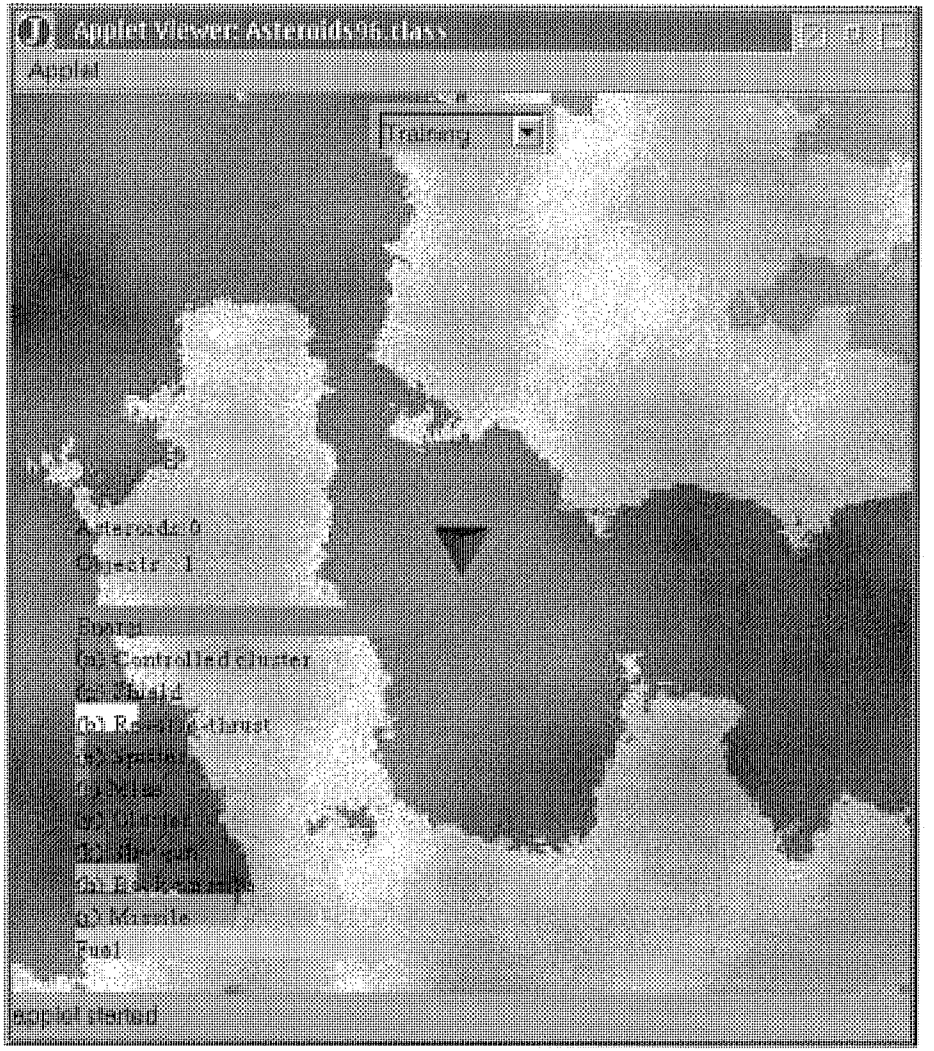


Figure 396. Example of a Java Application

One of the first Java applications was the HotJava Browser. It enabled the browser to bind dynamic new protocols and execute Java applications through the network. With the HotJava Browser and the Netscape 2.0 browser, Java became a language that can be used to illustrate and enhance normal HTML Web pages.

Java itself runs as an interpreter, similar to Smalltalk. This means that the code can be downloaded to many different hardware and software platforms and run unmodified.

There are also Java compilers that compile the tokenized code to real binary and hardware-specific code, which can be executed faster. OS/2 Warp 4 includes such a just-in-time compiler.

5.10.29.1 How to Run Java Applications in OS/2 Warp 4

The WebExplorer in OS/2 Warp 4 does not support Java applications. If you therefore connect to a page that is illustrated with Java applets, you will see only the normal HTML formatted text. This fortunately does not mean that you cannot run the Java applications that are referred to in this section.

To run an applet you have to create a URL object by dragging any part of the HTML document on to the Workplace Shell. The object that is created would normally launch the WebExplorer when you double clicked on it. To run the Java application embedded in the HTML document, do the following:

- Display the context menu for the URL object
- Click on **Open as**
- Click on **Java Applet Viewer from URL**

This will run the Java application in a separate PM window.

If there is an interesting Java application, for example a game, you can create a direct Java Applet Reference object to launch this program directly from the desktop without using the WebExplorer.

5.10.29.2 Configuring the URL Object

To create a URL object that directly launches the Java Applet Viewer, you have to open the object's Properties notebook. On the Browser page, you have to change the default browser for this application from EXPLORE.EXE, which is the WebExplorer, to APPLET.EXE (see Figure 397).

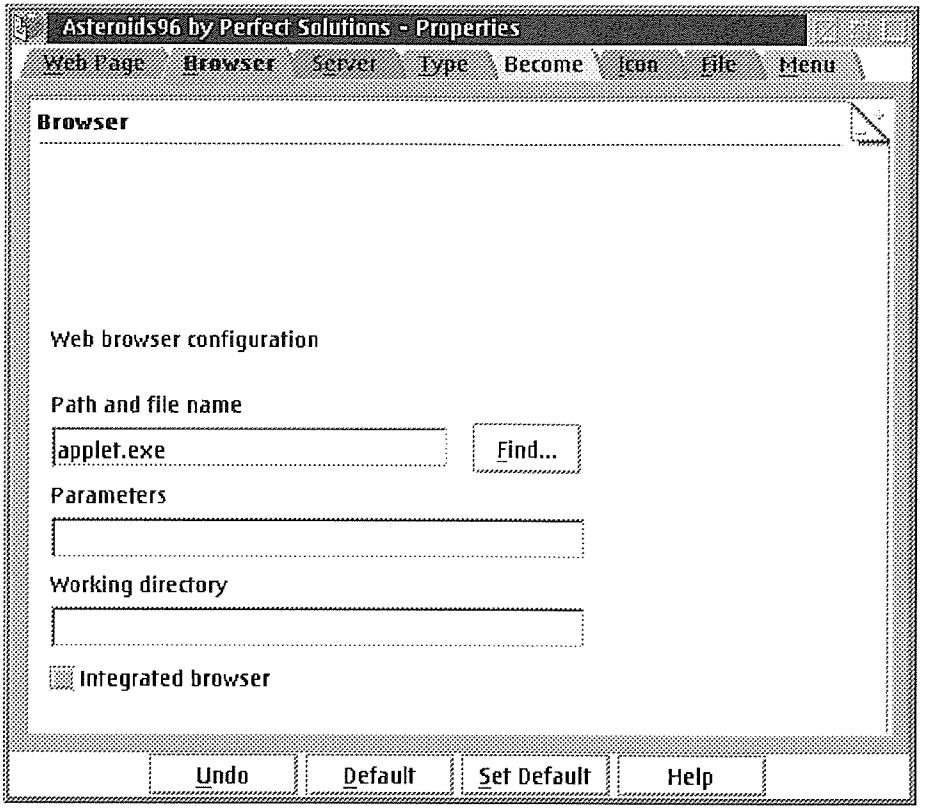


Figure 397. Configuring the Applet Viewer

Be sure that the Internal Browser check box is not selected. If you now double click on this object, it will launch the Java Applet Viewer.

Note

If you specify parameters for the WebExplorer and want them to be effective for all URL objects as well, click on the **Properties** notebook in the Browser page and specify these parameters in the Parameter field. Then click on **Apply**. This will update the WebExplorer and all URL objects. However, it will also affect URL objects that have been prepared to launch the Java Applet Viewer. These applications will not know how to handle the parameters and will therefore fail to start.

5.10.29.3 Configuring the Java Applet Reference Object

Java Applet Reference Objects are really easy to create. Simply drag and drop from the WebExplorer to the desktop or a folder. This URL does not point directly to a Java application, but to an HTML document that acts as the launcher or container for a Java application. The HTML file contains all the parameters for the Java application.

The reason for using the Java Applet Reference Class is that there is often no real need to go through an HTML document to launch an application. To change the parameters in an application that is in the form of a URL document, you have to receive the remote document onto your local machine. Make the changes in the document and redirect your URL object to this local file. Note that this document is now a static document on your PC.

With the Java Applet Reference Class object, you can launch a remote Java applet without going through the HTML document and specify or change any parameters in this object when you need to.

To create such an object you need the location of the Java Applet and the class name of the application. If you do not have this information and you are working on a Java application that is normally launched through an HTML file, you can load this HTML document in the WebExplorer and look in the source of it by pressing Ctrl+V when the document is loaded. All the data you need can be found in the "<applet" string.

```
<applet code="Asteroids96.class" width=500 height=500 align=center>
<param name=background  value=grafix/background2.jpg>
</applet>
```

In fact, all you are really interested in is the information located between the "<applet ...>" and "</applet>" tags. Now create a new Java Applet Reference object from the Templates for the Internet folder and open the Properties notebook (if it does not open automatically). See Figure 398.

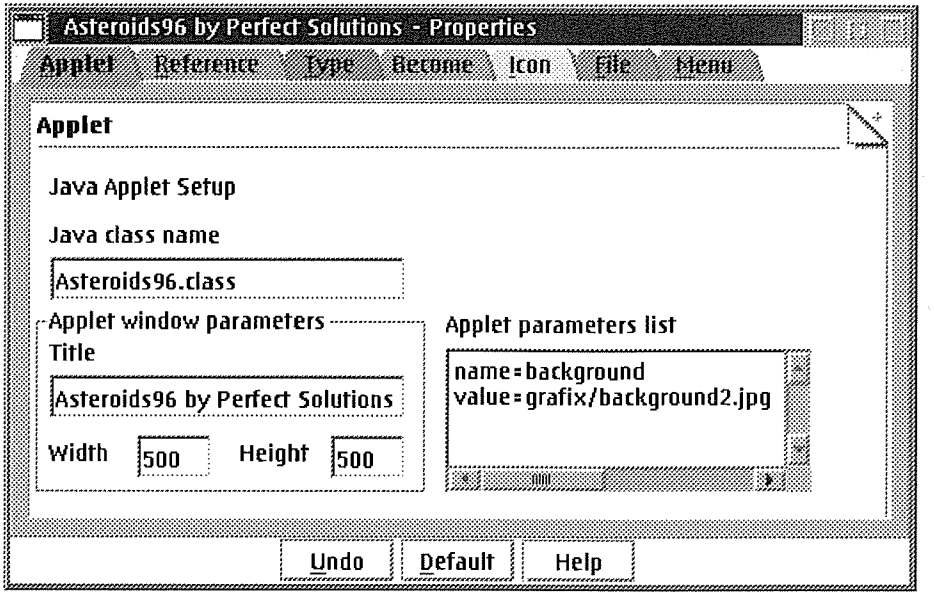


Figure 398. Configuring a Java Applet Class Reference Object - Applet

From the information between the <applet ...> and </applet> tags in the HTML document, you can extract the Java class name from the code= statement. Width and height are mostly not transferred correctly, because the application itself changes the size in most cases. To get an identical setup, you should get these values from the width= and height= statements in the HTML document. The Applet parameter list can be set with the lines following the params keyword, but without the keyword itself and each parameter on a specific line. Figure 398 on page 670 shows exactly how the parameters should be set for the example above. In this field you can also include or change the given parameters without any trouble.

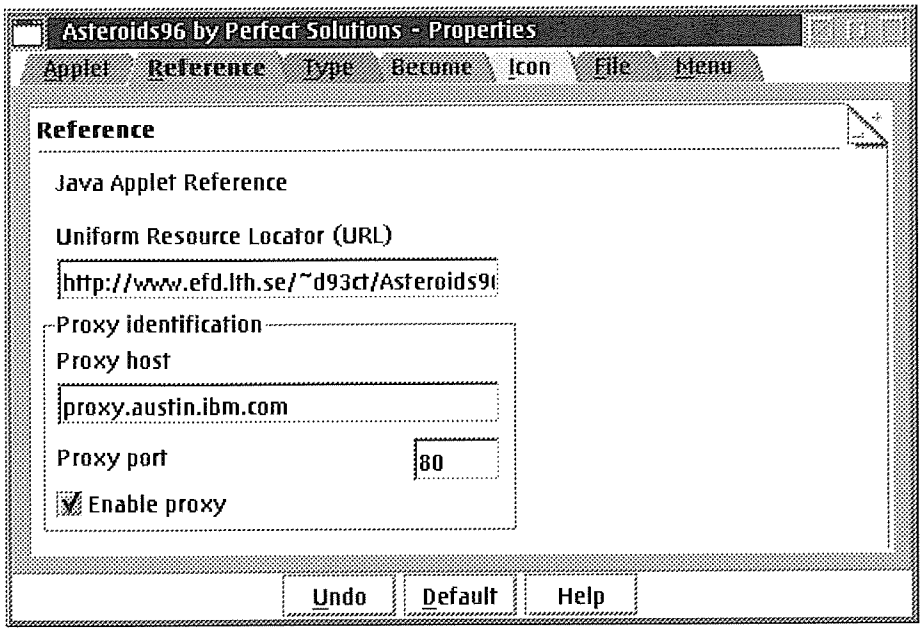


Figure 399. Configuring a Java Applet Class Reference Object - Reference

On the second page you must specify the URL directory location. This is not necessarily the same as the URL location. If the URL points directly to an HTML file, you have to specify this URL without the file.

For example. The URL for an HTML document with a Java applet is http://www.efd.lth.se/~d93ct/Asteroids96/index.html. In this case the URL for the Java applet will only be http://www.efd.lth.se/~d93ct/Asteroids96/. Do not forget the last slash! Depending on the target host file system between http://www.efd.lth.se/ and the last slash there can also be some backslashes, but the last character has to be a simple slash.

The proxy server that you can specify on this second page is needed only when your machine is connected in a protected network and you want to access an external server.

5.10.29.4 Running Java Applets from Your Local Machine

First of all, running a local Java applet is nothing really special, because a local Java applet can also be specified with an URL as with every other application. You can use both the URL Objects and the Java Applet Viewer Class Object to launch an applet. In addition you have the ability to run Java applet code in different ways (for example using the java command). For more information regarding the command line commands, please refer to generally available Java literature.

5.10.29.5 Developing Java Applications

You can develop Java applications with OS/2 Warp 4 because it includes the Java Development Kit 1.0 (JDK). There is also a lot of online literature about Java programming if you have installed the JDK. In the Java folder you can find a folder called Toolkit for Sun's Java Programming Environment. This folder contains among other things a URL to a local HTML document, FILE:///c:/javaos2/docs/api/API_users_guide.html, where c: is the drive where you have installed Java. The documentation is the HTML document that can be displayed with your WebExplorer.

To get some samples of Java applets you should also have a look at the \javaos2\demo directory or the URL folder called Samples for Sun's Java Programming Environment. This folder contains executable code and source code for a number of Java applications.

5.10.29.6 Configuring the Proxy

If you want to run Java applications that reside on the Internet and your machine is connected in a secured intranet behind a firewall you have to set up the proxy server for the Applet Viewer program. To get the address of the proxy server in your network, please contact your TCP/IP administrator.

To configure the proxy server for the Java applications, you have to start a local application. Click on the **Configure Applet Viewer** object in the Java for OS/2 folder to launch a very simple local Java application that explains how to configure the proxy. (See Figure 400.)

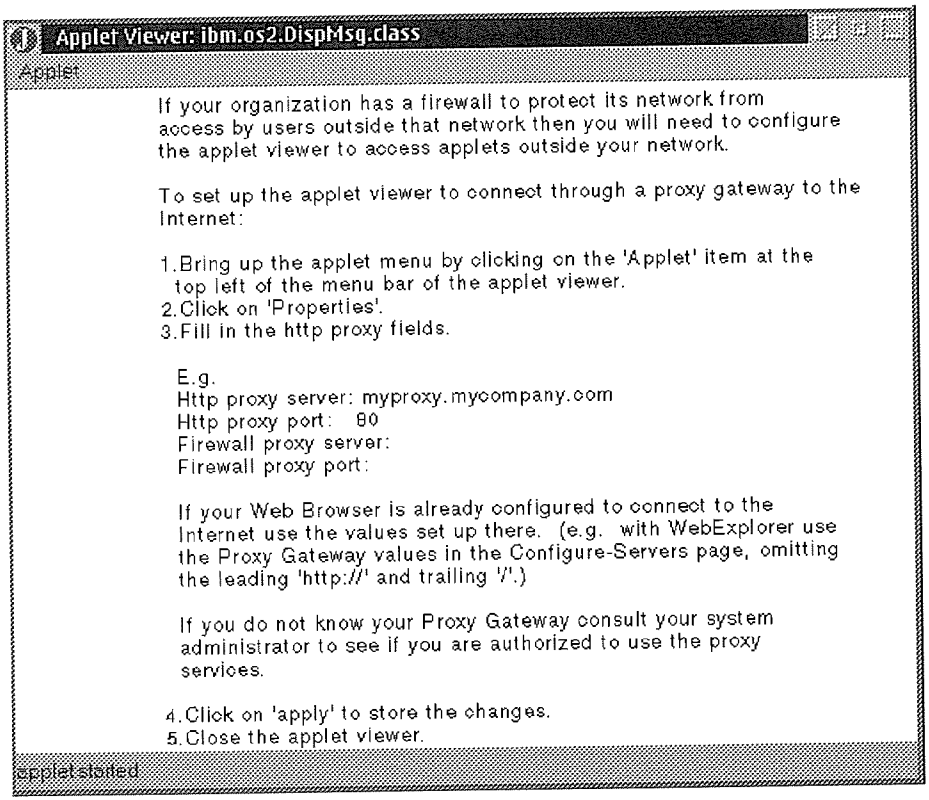


Figure 400. Configure Java Applet Viewer

To change the configuration, select **Properties** from the Applet menu of the application window. In the AppletViewer Properties dialog box (see Figure 401) you can then configure the HTTP and Firewall proxy server. When you click on **Apply**, this information is stored in \javaos2\hotjava\property and is valid for all Java applications.

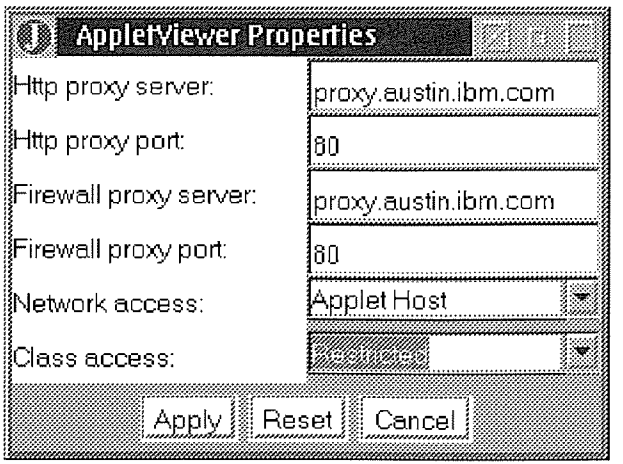


Figure 401. Configuring Proxy Servers for Java Applet Viewer

5.11 Personal Communications Entry Level

The version of Personal Communications (PCOMM) included in OS/2 Warp 4 is an entry-level version of the full-function product called Personal Communications AS/400 and 3270 for OS/2. The Entry Level version includes a subset of the functions provided by the full-function product. Functions that are available with the full-function product but not available with the entry-level product are often seen as grayed-out menu items on the various pull-down menus.

Even though it is an entry-level emulator, it provides improvement over the Telnet 3270 and Telnet 5250 functionality that was provided in earlier releases of OS/2 Warp.

5.11.1 Where to Find the Personal Communications Entry Level Folder

Even though Personal Communications - TCP/IP is part of the TCP/IP package in OS/2 Warp 4, the folder is kept in the Programs folder and not in the TCP/IP folder.

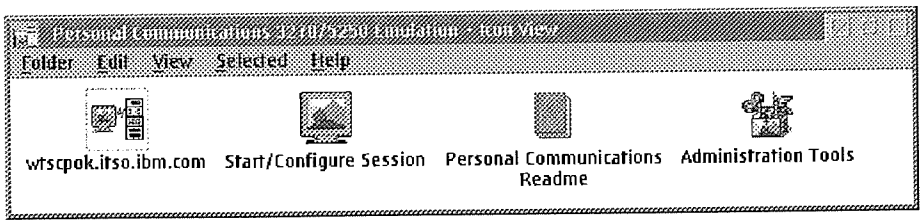


Figure 402. Personal Communications Entry Level Folder

The PCOMM folder, shown in Figure 402 on page 675, contains several objects, including the following:

- Start/Configure Session

  Use this icon to start and configure a new session for the first time. The PCOMM - Entry Level will allow you to use up to two sessions simultaneously, but you can configure as many different sessions as you like and save them as their own icons for later invocation.

- Administration Tools

  The Administration Tools folder provides a means for accessing several PCOMM maintenance tools that allow you to set up traces, apply fixes and CSDs, etc.

- Personal Communications Readme

  Double click on this icon to view the Readme file that comes with PCOMM. This file typically contains information about the product which is not included in the manuals.

- wtscpok.itso.ibm.com

  This icon is not included as part of PCOMM. It is representative of a session which has been configured by an end user. The icon name is customizable by the end user. This icon can be double clicked to start a previously configured session.

5.11.2 Configuring the Personal Communications Entry Level Connection

Before you can use the Personal Communications emulator, you must configure a session. You must also have TCP/IP configured and working. If you are not sure if TCP/IP is up and working, try to ping the mainframe or AS/400 host. You can do this from the OS/2 command prompt by typing in the following:

```
PING nnn.nnn.nnn.nnn
```

where `nnn.nnn.nnn.nnn` is the host address or the host name for example.

Configuring PCOMM is very easy. All you need is the IP address or the TCP/IP host name (alias) of the host that you want to access. The host can be either an IBM S/390

mainframe or an IBM AS/400 mid-range computer. To do this, you must first double click the **Start/Configure Session** icon in the Personal Communications 3270/5250 folder. The main PCOMM display session window will open and PCOMM will automatically invoke the configuration dialog box. (You can get to this dialog box at any time while you are running a Personal Communications session by selecting **Communication - Configure** from the main menu bar in PCOMM.) This configuration dialog box is shown in Figure 403 on page 676.

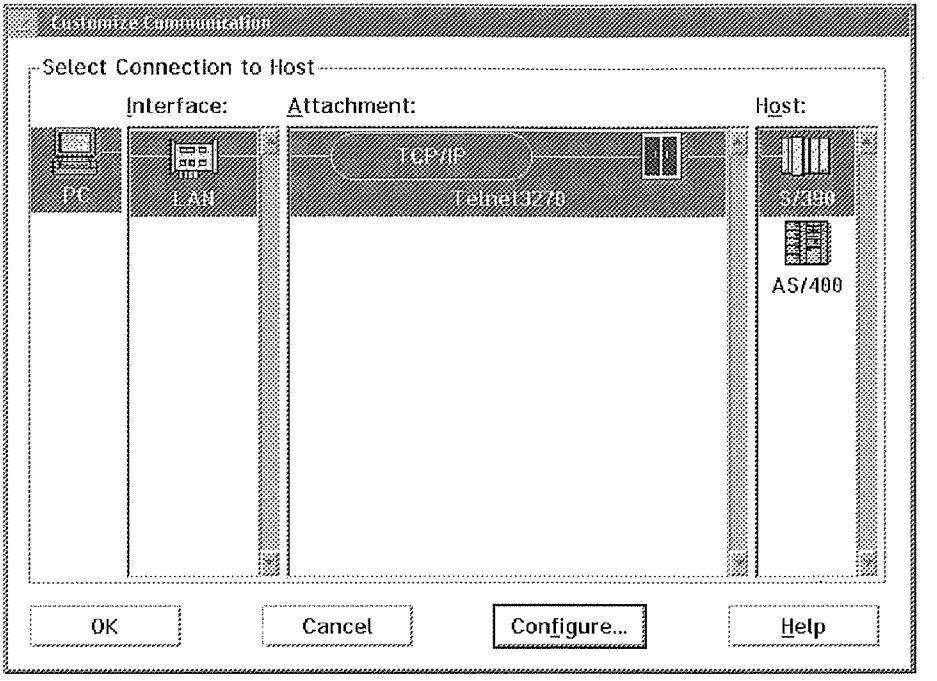


Figure 403. Personal Communications Configuration Dialog Box

In this first configuration panel you may select the type of host that you want to connect to. If you select **S/390**, you will get 3270 emulation using Telnet 3270 protocol. If you select **AS/400** as your host type, you will get 5250 emulation using Telenet 5250 protocol. Once you have selected your host type, click the **Configure...** button at the bottom of the dialog box.

A dialog box will pop up in which you can specify the screen size and the code page used on the host. Screen Size defines the number of rows and columns which the session screen will display. Host Code Page defines to the emulator the EBCDIC code page being used by the host computer. If you do not know what this value should be, then you should ask your system administrator. Normally the code page listed next to

your country's name is the correct choice. Press the **Help** button if you need more assistance.

The last thing you will need to do is to define the TCP/IP host name or TCP/IP address to the emulator. To do this click the **Configure Link...** button. A dialog box much like the one shown in Figure 404 on page 677 will appear.

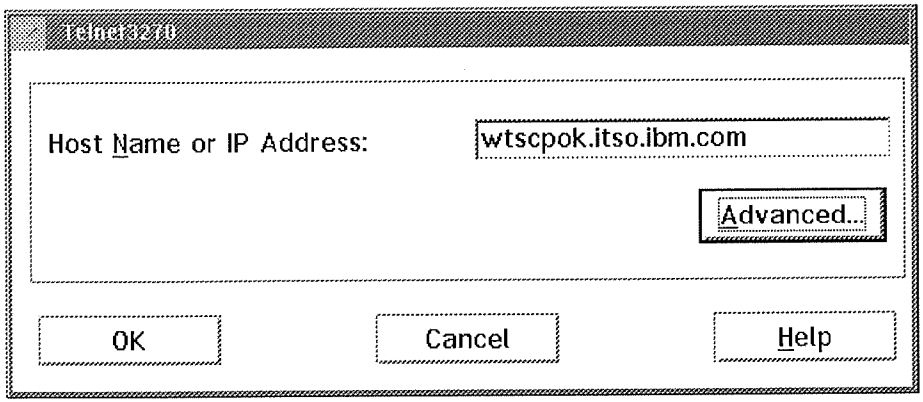


Figure 404. Personal Communications Remote Host Address Configuration

Enter the IP address or the TCP/IP host name (defined by your TCP/IP name server) for the host computer here.

If you want to configure other parameters for the connection, such as port number on the host side (23 by default), an LU name or the Auto-reconnect option, you have to click the **Advanced** button. In the configuration panel that appears you can specify each of these options. Many people find the Auto-reconnect option to be very useful, because it allows PCOMM to automatically try to reconnect to the host if the TCP/IP link goes down momentarily.

After closing all the configuration panels by clicking the OK buttons, the Personal Communications session will be connected to the host. You may also choose to manually connect and disconnect the session with the host by using the Communication - Connect/Disconnect menu option.

To save this configuration for later use, just select the **Save** item from the File option on the main menu bar. Alternatively you can choose to close the session and you will be asked if you want to save the session configuration. If this is a new configuration file (workstation profile) you will be asked if you want PCOMM to create an icon for this configuration in the Personal Communications 3270/5250 Emulation folder. An example of such an icon is illustrated in Figure 402 on page 675.

To establish a session with the host, double-click on this new icon and a host session to the defined host should appear. Figure 405 shows a Personal Communications Entry Level session with a connection established to the host.

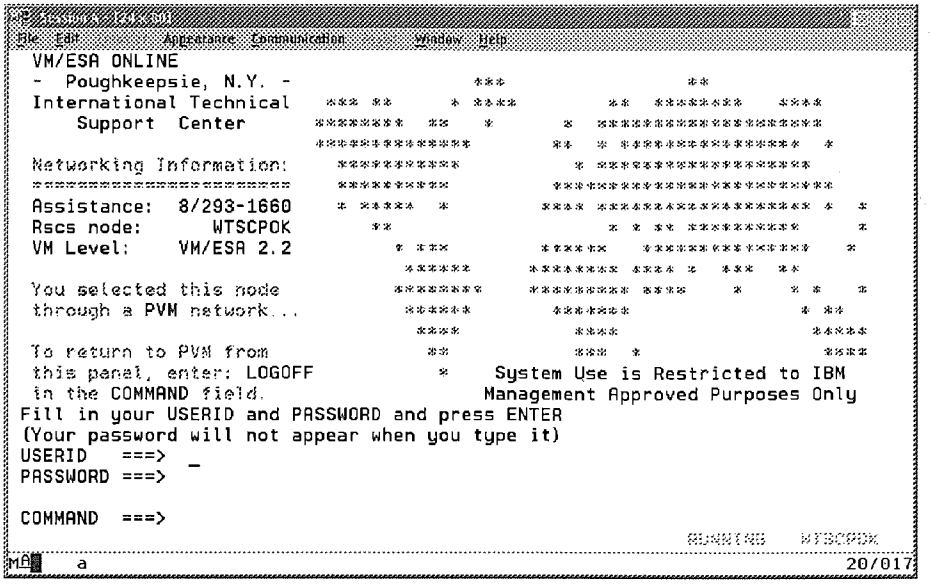


Figure 405. Personal Communications Entry Level Main Window with Connection

Many people will find it beneficial to create a shadow of this icon in the WarpCenter so that a host session can be started quickly. With Personal Communications - TCP/IP included with OS/2 Warp 4, you can start up to two host sessions at a time.

5.11.3 Uploading and Downloading Files

While the full-function product of Personal Communications provides several utilities that make transferring files from or to a host computer very easy, PCOMM - TCP/IP will allow you to transfer files from and to a S/390 mainframe using an OS/2 command line interface. The commands you need to do this are called SEND and RECEIVE commands. As with the full-function product, your host computer must have an IND$FILE utility on the host in order for a file transfer to be enabled. If your host machine supports FTP then you may alternatively be able to use FTP, to transport files from or to your host machine.

The following two sections will give a short overview of how to upload (SEND) or download (RECEIVE) a file to or from a host.

5.11.3.1 Sending Files from the PC to the Host

If you want to upload a file to the host in binary mode, just type the following command:

```
send <PC-FileName> <HOST-Session:><HOST-FileName>
```

Or to be more specific, if you want to upload a file called CLAUDIA.JPG to your host session A on drive A, type the following from an OS/2 command prompt:

```
send claudia.jpg claudia jpgbin a
```

You can see that you do not have to specify a host session if you want to access session A. If you want to upload an ASCII file to the host, just type:

```
send <PC-FileName> <HOST-Session:><HOST-FileName> (ASCII CRLF
```

If you want to upload an ASCII file called PHONBILL.TXT, then type:

```
send PHONBILL.TXT PHONBILL TEXT A (ASCII CRLF LRECL 132
```

The LRECL parameter stands for record length and must always be specified when the maximum line length in a the document exceeds 80 characters a line. CRLF provides a Carriage-Return Line-Feed conversion in the document, and ASCII tells the send command to do an ASCII-to-EBCDIC conversion.

5.11.3.2 Receiving Files from the Host to the PC

Receiving files using the RECEIVE command is very similar to sending files with the SEND command. The syntax to receive a binary file is:

```
receive <PC-FileName> <HOST-Session:><HOST-FileName>
```

Or to be more specific, if you want to download a file that a colleague sent to you called CLAUDIA JPGBIN A, just type:

```
receive claudia.jpg claudia jpgbin a
```

The file will be downloaded in binary and stored as CLAUDIA.JPG on your PC system. If you want to receive a text file from the host, just type:

```
receive <PC-FileName> <HOST-Session:><HOST-FileName> (ASCII CRLF
```

For example, if you have to download a file called JOKES TEXT A from your session B, just type:

```
receive JOKES.TXT B:JOKES TEXT A (ASCII CRLF
```

The ASCII option tells the system to translate the text from EBCDIC to ASCII and CRLF inserts the Carriage-Return Line-Feed characters at each end of a line. No LRECL is used because the PC does not use fixed record length.

Part 3. Advanced Concepts and Support

Advanced Concepts and Support Section

In addition to the multimedia capabilities found in previous versions, OS/2 Warp 4 is the first operating system ever to offer built-in speech recognition and Java capabilities. It also includes a system management client capable of local or remote monitoring and management. Its speech recognition functions give OS/2 Warp 4 users the capability of interacting on a verbal level with their computers. This section covers these functions as well as advanced topics in problem determination procedures and configuration for specific DOS and OS/2 application support.

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Chapter 6. Multimedia Applications and Utilities

Multimedia is the combination of media elements on a personal computer that enhance the communication of information. OS/2 Warp 4 offers a variety of audio and video features while supporting the latest hardware technology. OS/2 Warp 4 also includes high-performance multimedia application support, designed to make it easy for you to use your computer with friends or business associates.

The multimedia support provided in OS/2 Warp 4 allows you to:

- Store and view digitized photographs using the Eastman Kodak Photo-CD technology.
- View stored images in a variety of formats using the Multimedia Picture Viewer.
- Listen to audio CDs.
- Watch TV on your computer using video overlay hardware such as Hauppage Computer Works' WIN/TV card.
- Utilize audio device drivers that support compressed audio.
- Capture, store and play back video clips, using Ultimedia and IndeoVideo IN for OS/2
- Play AVI, FLC, FLI and MPEG clips.

  Note: MPEG playback requires hardware support.
- Develop multimedia graphics applications using the built-in DIVE (Direct Interface Video Extensions) application programming interface.
- Combine these multimedia elements into a single document using OS/2 Warp 4's OpenDoc application support.

These combined capabilities make OS/2 an ideal operating environment for multimedia educational programs and games, and also offers a compelling development environment for next-generation multimedia applications.

6.1 Installing Multimedia Support

Multimedia support in OS/2 Warp 4 is divided into three options:

- **Base Multimedia Support**

  Provides audio and image file support as well as support for FLC/FLI animation.
- **Multimedia OpenDoc Support**

  Allows you to imbed multimedia objects into documents to create multi-part documents that combine text, image, voice and other methods of communication. OpenDoc is described in 6.2.6, "OpenDoc - Multimedia in a Document" on page 705.

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- **Software Motion Video Support**

  Allows you to play full-motion video clips on your OS/2 Warp 4 system, without the need for specialized video hardware in your computer.

When you install multimedia support you can select which of the options you want to install.

Normally you will install multimedia support when you install OS/2 Warp 4 on your computer. Alternatively, you can use the Selective Install utility, as described in 2.6, "Selective Install" on page 55.

If you choose the **Easy** installation option, you will automatically install Base Multimedia Support and Software Motion Video. You will install this same combination if you simply select the **Multimedia Software Support** item in the OS/2 Setup and Installation window during the Advanced installation.

If you wish to install Multimedia OpenDoc Support, you must select the **More...** button next to the Multimedia Software Support item in the OS/2 Setup and Installation window, then select **Multimedia OpenDoc Support**. Note that you must also select **OpenDoc** in the Optional System Components item in order to install Multimedia OpenDoc Support.

6.1.1 Hardware Requirements

Some aspects of OS/2 Warp 4's multimedia support require additional hardware in your system. For example, if you want audio support, you will need a sound card and speakers. If you would like to record your own video clips, you will need a video capture adapter.

> **Note**
>
> You only need a capture adapter if you wish to *record* video footage. No additional hardware is required to play video clips.

You should remember that multimedia applications are somewhat memory intensive. If you intend to do a lot of multimedia work on your OS/2 Warp 4 system, you should ensure that you have sufficient memory installed in your computer. Multimedia has the following memory requirements:

- 4MB - System sounds and low quality audio
- 5MB - High-quality audio (22KHz or greater, 16-bit stereo)
- 6MB - System sounds, low-quality audio, and video playback
- 8MB - System sounds, high-quality audio (22KHz or greater, 16-bit)
- 12 - 15MB - Support for Overlay graphic adapters
- 24MB - OpenDoc part handlers (stereo and video playback).

See Appendix A, "OS/2 Warp 4 Hardware Requirements" on page 963 for more information on these requirements.

6.1.2 Installing Multimedia Devices

If you want to install Multimedia support after the OS/2 Warp 4 installation you must use the **Selective Install** program. Follow these steps:

1. Double-click on **OS/2 System**
2. Double-click on **System Setup**
3. Double-click on **Install/Remove**
4. Double-click on **Selective Install**

The first step of the installation process is to install support for your multimedia hardware. Click on **Multimedia Device Support**. In the Device(s) in System to be Installed window, the list on the right shows the devices that were detected by the Installation program. The list on the left shows all the multimedia devices supported by OS/2 Warp 4. If the list on the right is correct, select **OK.** If you want to add a device from the list on the left to the list on the right, highlight the name of the device in the Supported Devices window. Then click on **Add** to add the device to the list on the right. Click on **OK** when all selections have been made. For more information refer back to 6.1, "Installing Multimedia Support" on page 683 and also see Figure 406 on page 686.

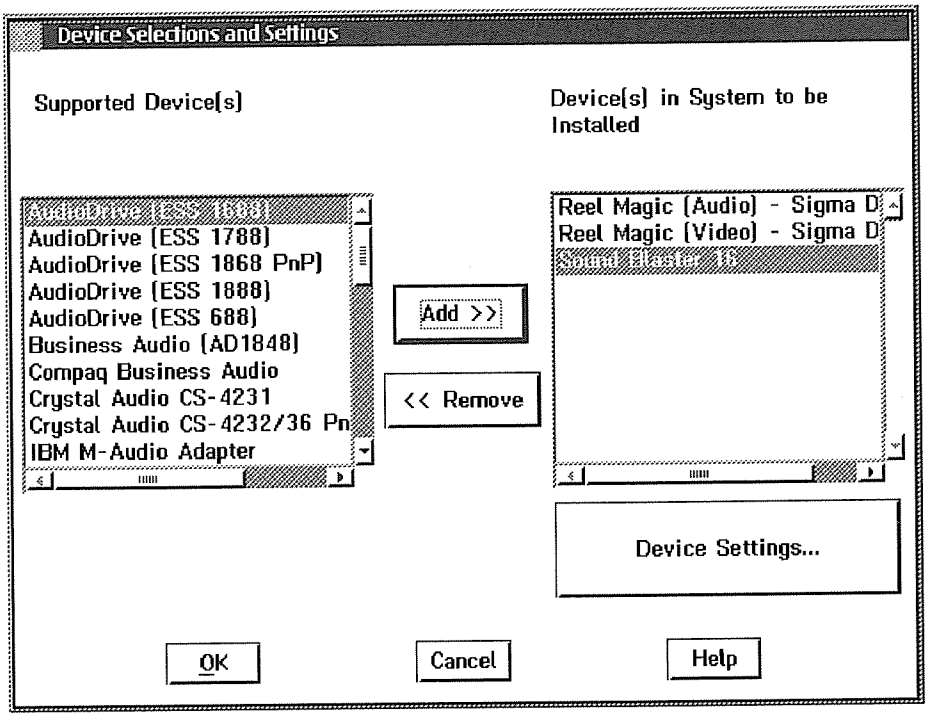

Figure 406. Device Selections and Settings

The next step is to install the Multimedia Software Support. In the OS/2 Setup and Installation window, select the **Multimedia Software Support** and click on the **More** button to select the multimedia features you wish to install. Click on **OK** when done. Also see 2.6, "Selective Install" on page 55 for more details.

6.1.3 Removing Multimedia Devices

There might be times when you want to remove support for a multimedia device. For example, suppose you change the video-capture adapter that you have in your computer. You can click on **Selective Install** to remove this support from your system:

1. Double-click on **OS/2 System**
2. Double-click on **System Setup**
3. Double-click on **Install/Remove**
4. Double-click on **Selective Install**

Use the Device(s) in System to be Installed window to indicate the multimedia support you want to remove from your system. The list on the right shows the support that is

currently installed. The list on the left shows the multimedia devices supported by OS/2 Warp 4 that are not installed in your system. To remove support for a device:

- Click on the unwanted item in the list on the right.
- Click on **Remove** to move the item to the list on the left. See Figure 406 on page 686 for an illustration.

To have removal of the device take effect, be sure to select **Multimedia Software Support** in the OS/2 Setup and Installation window.

6.1.4 Reconfiguring a Device

There might be times when you want to change the settings of an installed device to improve its performance. You can use Selective Install to do this:

1. Double-click on **OS/2 System**
2. Double-click on **System Setup**
3. Double-click on **Install/Remove**
4. Double-click on **Selective Install**

Click on a device from the list of installed devices on the right. Click on **Device Settings** to see the settings that are assigned to the selected device. The window shows the default settings for the device listed at the top of the window. It also shows how the device has been configured for any operating systems you are using. See Figure 406 on page 686 for an illustration.

To improve the performance of the device, you can change any of the settings:

- Press the Tab key to move between the entry fields.
- Click on the arrow next to each field to open a pull-down menu of possible, valid values. Refer to the documentation that came with the device for information about what values you should use.
- Click on **OK** when you are done. Select **Cancel** to exit from the window without making any changes. Also see 2.11.1.3, "The Hardware Manager" on page 133 for more detailed descriptions of device settings such as IRQs, DMAs, etc.

To have the setting changes take effect, be sure to select **Multimedia Software Support** in the OS/2 Setup and Installation window.

6.1.5 Multimedia Application Installation

Use the Multimedia Application Install program to install products that are supported by OS/2 multimedia. The Multimedia Application Install program is in the Install/Remove folder. The Install/Remove folder is located in the System Setup folder that is located in the OS/2 System folder that is located on the desktop. To use Multimedia Application Install, follow the installation instructions provided in the documentation for the product.

6.1.6 Multimedia Setup

Open Multimedia Setup to view setup pages for the multimedia subsystems you installed for the hardware devices on your system. For example:

- If you have an audio adapter installed, you will see pages for MIDI and Digital Audio.
- If you have a CD-ROM drive installed, you will see a Compact Disc page.

All multimedia subsystems use a *multimedia work path* to store temporary files. Initially, this directory is \MMOS2 but it can be changed using the System page of Multimedia Setup. If you plan to do extensive audio file recording or editing, you might want to change the multimedia work path to a directory on a drive with plenty of extra space.

6.1.6.1 Adjusting Video Alignment

If you installed support for a video capture device, the Digital Video 2 tab appears in the setup notebook. The Defaults page has a spin button that allows you to select another real-time compression type as the default. The system default is Ultimotion Real Time. See 6.2.4.3, "AVI Files" on page 702 for the default values. The Defaults page also has buttons for alignment and video.

The video-capture adapters are normally graphics overlay devices that display a window for monitoring the video source. Sometimes the video image does not align properly inside the window.

If you have an alignment problem, select **Alignment** in the Digital Video 2 section of the Setup notebook. Then select the appropriate settings to align the image of the video-capture device (source) with the VGA signal of the display device (destination). The following settings are made individually for the source and destination.

- VIDEO START

  Moves the scan line that starts the image. The higher the setting, the farther down the scan line starts.

- START X

  Moves the image left to remove garbled information along the left edge.

- START Y

  Moves the image up to remove garbled information along the top edge.

- WIDTH

  Adjusts the width. If the width is too wide, the image is squeezed toward the left, causing garbled information to appear on the right. If the width is too narrow, the right side of the image is cut off.

- HEIGHT

Adjusts the image height. If the height is too high, the image is squeezed toward the top, causing garbled information to appear at the bottom. If the height is too low, the bottom of the image is cut off.

The window provided by a graphics overlay adapter displays a key color when no image is present. The key color is used by the video adapter as an indicator for where to put the incoming video signal on the display. Use the spin button in the Video Alignment Window to select the key color. Make sure you select a color that is infrequently used. Select OK for the key color change to take place.

Use the arrows in the Input Connector field to select an input connector. Some video capture devices have multiple input jacks. The input-connector setting identifies which input jack will be used. To verify the number assignments for input connectors, refer to the documentation that came with your video-capture device.

Identify the video-source type supported by your adapter by pressing the NTSC or PAL radio button:

- NTSC

  National Television Standards Committee (NTSC) is the video broadcast standard for North America and Japan.

- PAL

  Phase Alternation by Line (PAL) is the video broadcast standard for the United Kingdom, Europe (with the exception of France), Australia, and South Africa.

6.1.6.2 Changing TV Channels

If you have a WinTV adapter and install WinTV support, a Tuner Adjustments window is provided in Multimedia Setup. Using this window you can select a TV broadcast region and switch channels within the region. Worldwide, there are seven major regions (ranges of frequencies) that are defined for broadcast television:

- USA Air
- USA Cable
- Western Europe Air
- Western Europe CCIR Cable
- Australia
- Japanese Air
- Japanese Cable

You can select any one of these regions. The USA Air region includes the frequencies that are received by antenna, whereas USA Cable includes the frequencies that are transmitted by satellite for Cable TV.

After you select a region, you can select a channel in the region. Regions are defined to the system by means of ASCII files that specify the frequencies of all the channels in the region, starting with the low channel and ending with the high channel. The ASCII file are the format .RGL. A channel in the region can be omitted from the selectable list by specifying a -1L character for that channel in the ASCII file. Tuner files are in the \MMOS2\REGION directory.

In addition to the major regions, subregions can be defined for local broadcast regions.

6.2 Multimedia Features

After you install multimedia support, you will find the Multimedia folder inside the Programs folder on your desktop. When you open the **Multimedia** folder it appears similar to that shown in Figure 407.

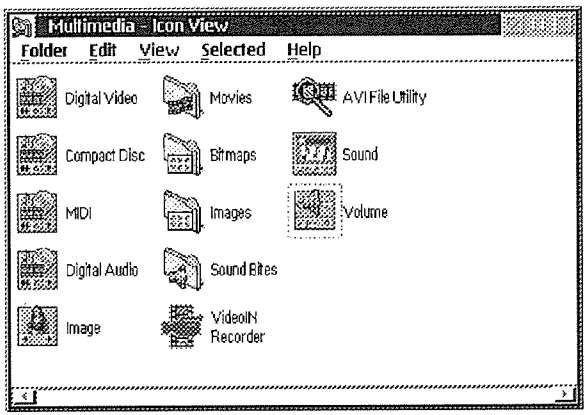

Figure 407. Multimedia - Icon View

This folder contains program objects that allow you to work with sound, images and video. The program objects are:

- Digital Video
- Compact Disc
- MIDI
- Digital Audio
- Image
- VideoIN Recorder
- AVI File Utility

It is often more convenient to work directly with sounds and video clips. The Multimedia folder contains a number of folder objects, which contain sample files:

- The Movies folder
- The Bitmaps folder
- The Images folders
- The Sound Bites folder

The final two objects in the folder are the Volume object that allows you to control the volume level for your speakers, and the Sound object that allows you to set properties for system sounds. See 6.2.2, "Miscellaneous Sound Settings" on page 696 for details on system sounds.

OS/2 Warp 4's multimedia support has been developed for ease of use with the Workplace Shell. OS/2 Warp 4 establishes associations between multimedia objects and the programs that will play them, during installation of the multimedia support. To play a video object or listen to an audio object, simply find the object you want (for example, one of the sound files in the Sound Bites folder) and double-click on it. Double-click again while the object is playing to stop it.

Let us now have a look at some of the multimedia applications and utilities.

6.2.1 Audio

OS/2 Warp 4 provides audio support for most of the audio devices currently on the market. You can use these devices under OS/2 Warp 4 to provide sound for your multimedia applications and games. In addition, OS/2 Warp 4 allows you to control audio devices directly. You can play normal music CDs on your computer while you are working with a spreadsheet or letter.

6.2.1.1 Playing Compact Discs

The Compact Disc Player object allows you to play music CDs on your OS/2 Warp 4 system, provided you have the required hardware such as a CD-ROM drive and a sound card. When opened, the Compact Disc Player looks and behaves similarly to a conventional CD player.

Tip

You don't need a sound card to listen to CDs. Many CD-ROM drives supported by OS/2 Warp 4 have a built-in audio function. You can listen to music CDs using headphones connected to the headphone jack of your CD-ROM drive. If you have an audio device, you can pipe the music through to your speakers. Merely connect the output jack of the CD-ROM drive to the input jack of your audio device. However, not all CD drives have headphone jacks.

Figure 408 on page 692 shows the Compact Disc Player window.

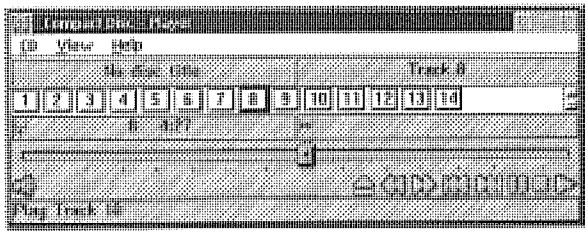

Figure 408. Compact Disc Player

The CD player has many features. Many of the features are self-explanatory. For example select a track, play, pause, skip forward or stop. The View pull-down menu contains many additional built-in features such as Random Play and Repeat Play.

You can, for example, select the **Slider** from the View menu to see a visual representation of the position in the CD program. The tracks are shown as tick marks along the base of the slider box. You can change the position by dragging the slider arm forward or backward with the mouse.

Select **Control bar** from the View menu to display buttons that enable you to control your position in the CD. To display or update the contents of a CD program, select **Edit program** from the CD menu. To display the title of the CD and the title of the current track, select **CD title area** from the View menu. The title of the track defaults to the track number, or it can be a name that you assign either by clicking on **Edit program** from the CD menu or by typing the title directly in the Title field. To edit the title:

- Place the cursor in the Title field
- Type the new title
- Press the Enter key

The information you type in for CD titles or track names will be saved.

With some CD-ROM devices, digital audio data is transferred from a CD to an audio device installed in the computer via a cable. After processing the data, the audio device sends the data to its speaker jack. The sound produced can be of higher quality than the sound produced by connecting a speaker directly to the analog headphone jack. Digital transfer is useful to record from CD but is not normally needed.

If your CD-ROM device can transfer data internally and you have an audio device installed in your computer, you may click on **Digital transfer** on the View menu.

6.2.1.2 Digital Audio

OS/2 Warp 4 provides support for playing digital audio files. To play these files, you need an audio card and speakers. You can play a sound object by double-clicking on it, or by displaying a pop-up menu for the object. To display the pop-up menu:

1. Click once on the object with the right-hand mouse button
2. Click on **Open as**
3. Click on **Play**

Use the Digital audio program in the Multimedia folder to record or edit digital audio. To make and save changes to an audio file, display the file's pop-up menu and select **Audio editor.** When the Audio Editor is displayed, you can place your mouse pointer on any button, icon, field, or action-bar item in the editor window. A description of that item is displayed in the Information area at the bottom of the window.

A graphical display of the audio file appears in the middle of the window. This can be used to edit the current audio file. The graphical display appears in the window only if the audio file is a wave file that can be edited. Select **Toolbar** on the View menu to display the tool bar (if it is not already displayed). Use the icons on the tool bar to perform edit actions on the audio file (such as cut, copy, and paste).

The Digital Audio editor allows you to record, edit and play sound files in the WAVE format provided you have the appropriate hardware. The Digital Audio editor is shown in Figure 409.

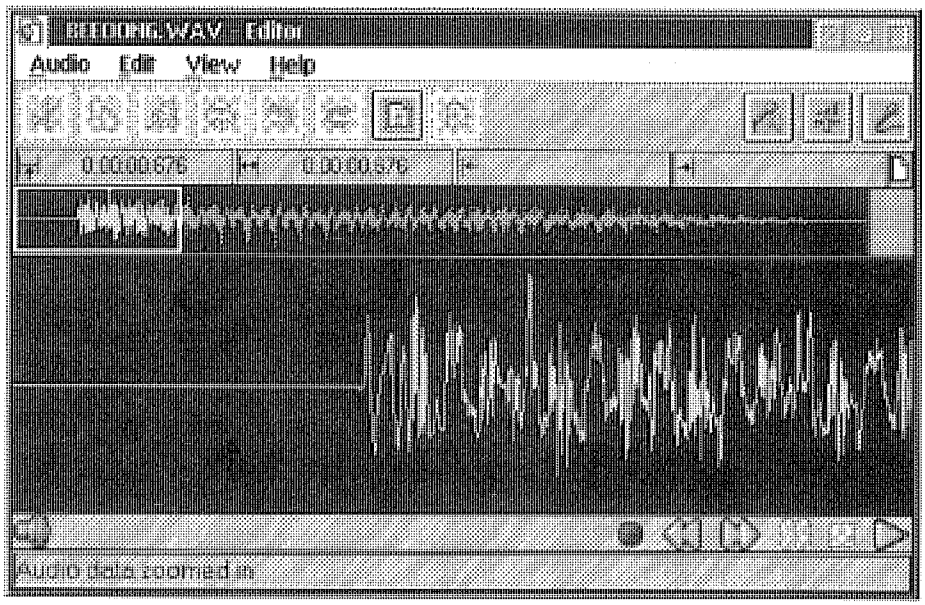

Figure 409. Digital Audio

The editor allows you to edit, add special effects and record your own sound files. Most sound cards allow you to attach a microphone or *line in* connection for direct recording

from another device such as a stereo system. This allows you to record your own sound bites and store them as WAVE files.

To record a new audio file:

- Select the **Input** icon on the tool bar to select whether you want to record with a microphone or a line-in device.
- Select the **Input level** icon on the tool bar to set the input level for recording with a microphone or a line-in device.

  To set the maximum input level, move the slider bar all the way to the right.
- Select the **Record** push button to start recording.
- Select the **Volume** push button to adjust the volume.

If you intend to use the Audio Editor to edit large wave files (1 minute or more), then you might want to increase the MINFREE parameter of the SWAPPATH statement in the CONFIG.SYS file to provide an earlier warning when the amount of swapper disk space is reaching low levels.

6.2.1.3 MIDI

The MIDI editor allows you to alter sound files in the MIDI format (*.MID is the normal file extension). MIDI files are recorded using specialized hardware and software and are usually produced by musical instruments such as synthesizers. The MIDI editor is shown in Figure 410 on page 695.

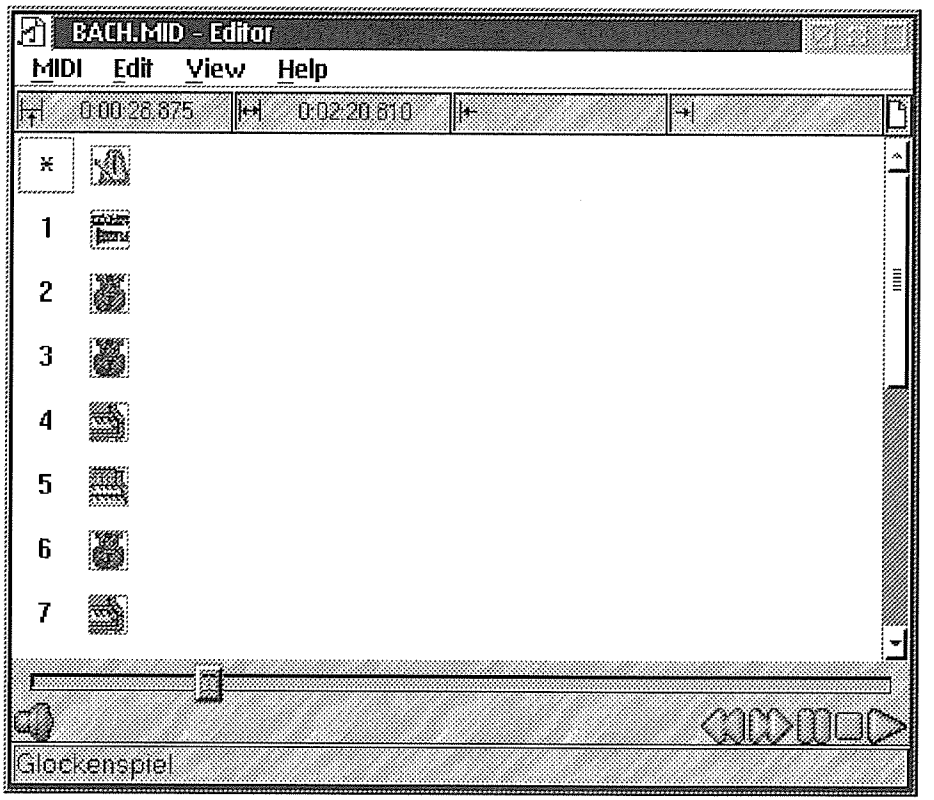

Figure 410. MIDI Editor

Each instrument in a MIDI file is recorded on a separate *track*. By double-clicking on the icons in the window, you can select instruments and change the way each instrument plays. You can also change the tempo of the music by selecting the metronome icon, marked with an asterisk (*). The online help text provides full instructions on using the MIDI editor to edit files.

To play an existing MIDI file, display the file's pop-up menu and select **Open as**, and then **MIDI Editor,** or double-click on the object. To make and save changes to a MIDI file, display the file's pop-up menu and select **Open as**, and then **MIDI Editor.** When the MIDI Editor is displayed, you can place your mouse pointer on any button, icon, field, or action bar item in the editor window. A description of that item is displayed in the Information area at the bottom of the window.

To edit a MIDI file:

- Select **Editor view** on the View menu to display the MIDI control area. This area of the MIDI editor allows you to adjust the volume of MIDI sounds, and to replace existing MIDI sounds by those you select from the Instrument Assignment list. Some MIDI files can have up to 16 channels available.
- To display the Instrument Assignment list, double-click on an instrument icon. You can select a new instrument from the list to replace the one currently selected.
- To adjust the volume of a selected instrument, select the **Volume Control** push button to display a volume-control window. Use the mouse to adjust the volume to the proper level, and then click anywhere outside the volume-control window to close the pop-up and enable the changes.

Notice that MIDI files can play much longer and yet are smaller than .WAV files. That is because MIDI files contain commands for playing the audio, rather than the actual audio data. The commands represent musical events, such as turning a note on or off, as well as timing commands that specify the duration of the note sound.

6.2.1.4 Sample Sounds

The Sound Bites folder contains sample MIDI and WAVE files. Simply double-click your left mouse button on any of these objects and you will hear them play. Click on the **Open as** option on the context menu of each object to edit the files using the MIDI and Digital Audio editors. You may also click on the **Open as** option to open the appropriate player for the object type.

6.2.2 Miscellaneous Sound Settings

Using the OS/2 Warp 4 multimedia audio features you can set some additional system sounds. OS/2 Warp 4 also provides you with different sound schemes. This section will briefly discuss how to configure these settings.

6.2.2.1 System Sounds

To set the system sounds in OS/2 Warp 4, click on the **Sound** object in the System Setup folder. These sounds alert and inform you of activities on the system. A set of system sounds is included and already associated with system events. You can make different associations using these sounds, or you can create your own sounds. Click on the **Play** push button to test a sound file before it is associated with a system event. Use the volume control dial to set the volume level of the sound. If you check **Apply volume to all sounds**, whatever volume level you set is automatically applied to all system sounds.

6.2.2.2 Sound Schemes

You can use the Sound object to set a sound scheme for your computer:

1. Double-click on **Sound**
2. Click on the **Scheme** tab
3. Click on a sound scheme in the list

4. Click on **Apply**
5. Close **Sound**

The sound will now use the selected sound scheme.

6.2.2.3 Volume Control

Select the **Volume** object to set the volume level of all sound-producing media devices connected to your computer system. You can access the pop-up Volume Control push button in any editor window that supports sound. When the push button is selected, a Volume Control window is displayed.

Use your mouse to adjust the volume to the proper level. To enable the changes, click anywhere outside of the Volume Control window. The Volume Control program is similar to an amplifier in a stereo system. For example, if other programs (such as Digital Audio) are controlling specific devices, adjusting the volume control has the following effects:

- Decreasing the volume control decreases the volume for a device, even if the controlling program has set the volume of the device to the maximum level.
- Increasing the volume control increases the volume for a device up to the level set by the controlling program.

You can control the volume of an external device regardless of the volume settings shown by the Volume Control or other programs. For example, the volume of a device connected to an audio amplifier or powered speakers can be raised or lowered (using volume controls on the devices) even if the Volume Control settings are unchanged. The exceptions are if the volume control is set to 0 or if the audio is muted.

After a volume level has been set externally (using volume controls on the devices), the Volume Control program can be used to lower or raise the level.

Setting the volume control to a given level will affect devices differently, depending upon the capability and volume-level setting of the particular devices. Therefore, some devices might appear to change volume level more rapidly than others. For example, suppose you are simultaneously playing a MIDI device with a low volume setting and a CD player with a high volume setting, and you use the Volume Control program to reduce the volume to 50%. Because the Volume Control program scales the volume level of all devices at the same rate, the MIDI device might become inaudible while the CD player can still be heard.

6.2.3 Image

OS/2 Warp 4, can view digitized photographs and images in a variety of formats:

- BMP - Bitmap
- DIB - RIFF DIB Image
- GIF - GIF Image Compressed
- JPG - Baseline JPEG

- PCX - PCX Image Compressed
- TGA - Truevision TARGA
- TIF - Tag Image File Format
- VID - IBM Mmotion Still Video Image
- PCD - Kodak Photo-CD Image

Pictures in many of these formats can be obtained from online services such as the Internet, or you can create your own images using a scanner. You can store the image files on your hard disk and view them using the Image viewer.

6.2.3.1 The Image Viewer

The Viewer window allows you to view images and perform a limited set of editing functions. You can change an image from color to grayscale (that is, black-and-white), change its size, crop the image or create an icon from the image by clicking on the **Set Icon** item from the Image pull-down menu. When you open the **Image** object, you will see a Viewer window like that shown in Figure 411.

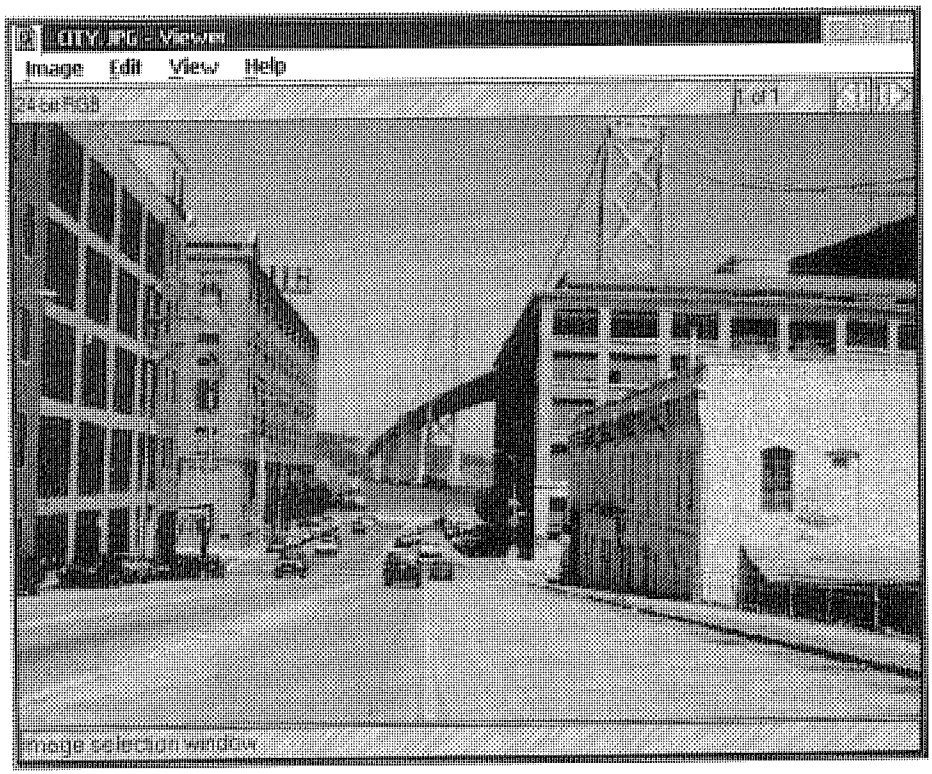

Figure 411. Image Viewer

The context menu of an image object allows you to convert the object from one format to another, without having to open the Viewer window. This conversion can be useful to save space. For instance, a GIF file is typically smaller in size than a bitmap file. Some applications also require images in a certain format, thus requiring you to convert your image to suit the application.

To display a sample image in the Image viewer:

1. Double-click on **Programs**
2. Double-click on **Multimedia**
3. Double click on **Bitmaps**
4. Double-click on the image

OR

1. Display the pop-up menu for an image file
2. Select **Open as**
3. Select **Image viewer**

If you place your mouse pointer on any button, icon, or menu bar item in the editor window, a description of that item is displayed in the Information area at the bottom of the window.

To change the appearance of an image select **Statistics area** from the View menu to display information about the image file. For example, the top line shows how many colors are in the current image, and whether or not the image can be displayed in more or less colors. Select **Scale to fit window** on the View menu to fit (stretch) the selected image to fill up the entire Image control window.

Use the choices on the Edit menu to make changes to an existing image. Some edit choices require that you first mark (select) a file area in the Edit window. For example, you cannot select **Copy** until the file area to be copied is marked. A few menu choices require that you use another choice first. For example, you cannot select **Paste** until you select **Cut** or **Copy**.

6.2.3.2 Using Images As Screen Backgrounds

If you have the Multimedia OpenDoc Support feature installed, you can use images in any of the supported formats as the background for your desktop or folders.

Note that if you *do not* have the Multimedia OpenDoc Support feature installed, you can only use bitmap files (*.BMP) as your desktop or folder backgrounds. While you can convert files into bitmaps from other formats, you may lose resolution or color quality if you do so.

6.2.3.3 Light Tables

OS/2 Warp 4 provides a specialized type of folder for you to store image objects. A Light Table folder contains a collection of images in any of the formats noted above. Images in the Light Table folder appear as thumb-nail icons, which are small versions of the image, designed to assist you in locating the image that you want. You can view an image simply by double-clicking your left mouse button on its thumb-nail icon. A sample light table is shown in Figure 412.

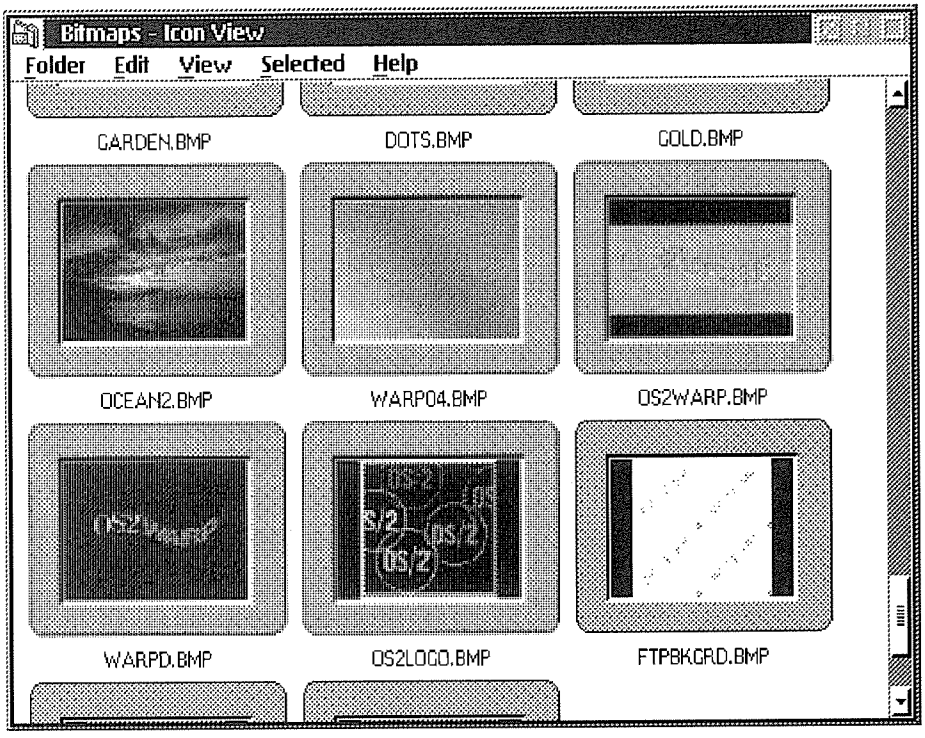

Figure 412. Light Table

You can create your own light tables by clicking on the **Light Table** template in the Templates folder. You can create a light table on your desktop or inside another folder. You can then add image objects to the Light Table folder by dragging and dropping objects onto the folder.

Note that since a light table is simply a special type of folder, it retains all the properties of a normal folder. Any actions that you can perform on a normal folder can also be performed on a light table.

6.2.4 Video

The Digital Video object in the Multimedia folder allows you play, edit and capture video with the appropriate hardware. When you open this object, the Editor window appears as shown in Figure 413.

Figure 413. Digital Video - Editor

6.2.4.1 Digital Video Editor

The Editor window allows you to edit the sound and picture aspects of a video clip.

If you place your mouse pointer on any button, icon, field, or menu bar item in the Editor window, a description of that item is displayed in the Information area at the bottom of

the window. The Video Editor can play AVI and MPEG movies, as well as FLC and FLI animation files.

As with other multimedia objects, each video file is represented in the Workplace Shell as a data object. You can view a video file by double-clicking on its icon. The context menu for each object allows you to open the **Digital Video Editor** by selecting the **Open as** item.

6.2.4.2 Movies

The Movies folder within the Multimedia folder contains a sample video clip in AVI format. You can use this clip to experiment with playing movies and editing clips using the Editor window.

Movies for the personal computer are compressed during the recording process and decompressed so they can be played. Compression of the large volume of video data required for movies is necessary so the data can be stored efficiently. AVI movies are compressed by programs that run on OS/2, whereas MPEG movies must be compressed off-line using a powerful computer. OS/2 MPEG movies require video playback adapters to decompress them for playing.

OS/2 Warp 4 supports the following movie formats:

- AVI
- MPEG
- FLC and FLI

6.2.4.3 AVI Files

You can play .AVI files in OS/2 Warp 4 by simply following these steps from the desktop:

1. Double-click on **Programs**
2. Double-click on **Multimedia**
3. Double-click on **Movies**
4. Display the pop-up menu for an .AVI file.
5. Click **Open as**
6. Click **Video editor**
7. Click **Play**

Another way to play a .AVI file is to double-click on the .AVI file.

Note

If you installed OPENGL or Games support, the movies folder will also include .FLC files

To record a movie you need a video capture adapter and a video source device. OS/2 Warp 4 supports the recording of AVI movies in real time. Following are the default settings for real-time recording:

Compression type: Ultimotion

Resolution: 160 x 120

Frame rate: 15 frames per second

You cannot change the default settings. Use the Video Editor to record AVI movies. If you want your movie to have a sound track, you will also need an audio adapter. The video source device can be a videotape player, videodisc player, or camcorder. You can record live with the camcorder, or you can record from a camcorder tape you previously recorded.

Output from the video source device is connected to the line-in jack of the video capture adapter. This connection provides the analog video signal that is digitized by the video capture adapter. After you set up your video hardware and install OS/2 support for your video capture adapter, you are ready to record. To record the movie:

- Open the **Video Editor**
- Use the controls on the video source device to select the starting position in the medium.
- Select the **Play** push button on the video source device. (Select the **Record** push button if you are recording live from a camcorder).
- Select the **Record** push button to begin recording.
- Select the **Stop** push button to end the recording.
- After recording is finished, save the recording as a movie file:
  1. Select **File**
  2. Select **Save as**
  3. Type a file name with an .AVI extension.

6.2.4.4 MPEG Files

MPEG (Motion Picture Experts Group) is a standard for motion video that includes decompression and synchronization of audio and video data. Because MPEG decompression is very fast, it can accommodate the high data rate that is required to play motion video from a CD-ROM drive. MPEG movies are displayed at 30 frames per second.

To play MPEG movies from CD-ROM or hard disk you must have a MPEG adapter such as the ReelMagic video playback adapter in your machine. The appropriate device drivers must be installed using the OS/2 Warp 4 Selective Install program if not already present. An additional program folder will be added to your multimedia folder. This will be called Digital Video Player 2. To play an MPEG movie file:

1. Double-click on **Programs**
2. Double-click on **Multimedia**
3. Double-click on **Digital Video**
4. Display the pop-up menu for an .MPG file.

Change to the drive and directory that contains the MPEG CD and select a MPEG file to open. When the video editor appears, click on the **Play** push button to start the movie.

Alternatively you can follow these steps:

1. Insert a MPEG CD in CD-ROM drive
2. Double-click on **OS/2 System**
3. Double-click on **Drives**
4. Double-click on your **CD-ROM** drive
5. Display the pop-up menu for a .MPG movie file
6. Click **Open as**
7. Click **Video Editor**

When the editor is displayed, select the **Play** push button and watch the movie.

6.2.4.5 FLC and FLI Animation Files

OS/2 Warp 4 also supports Autodesk's FLC/FLI animation format, allowing you to play animated video clips that were created using this format. FLC/FLI is a format that allows you to store animated images in a highly compressed format (so they do not take up much disk space) and play them back in a smooth, jerk-free manner.

One drawback of the FLC/FLI format is that it does not normally provide sound. However, OS/2 Warp 4 allows you to combine sound and animation in one clip through a special feature of OS/2 Warp 4's Digital Video facility. Assume that you have an animation file named JET.FLC, and you want to combine it with an audio file named NOISE.WAV. All you need to do is copy the two files into the same directory, and rename the audio file to have the same name as the animation file (in this example, JET.WAV). Now, whenever you play the animation file, OS/2 Warp 4 will use the audio file as accompanying sound.

FLC and FLI files normally use the following resolutions:

```
FLC  640 x 480
FLI  320 x 200
```

To play an animation file, select a file with an FLC or FLI extension. Display the pop-up menu for the selected animation file. Select **Open as**, and then **Video Editor.** When the editor is displayed, select the **Play** push button to play the animation.

6.2.5 Additional Multimedia Features

Apart from the above-mentioned multimedia features, OS/2 Warp 4 also support some additional features.

6.2.5.1 Video Overlay

OS/2 Warp 4 also supports a number of popular video overlay adapters, such as the WIN/TV card from Hauppage Computer Works Inc., which allows you to turn your computer into a TV. You can run a TV session in the foreground or background, and you can size the TV window so that you can continue to do other tasks while watching TV.

6.2.5.2 Video IN

OS/2 Warp 4 allows you to capture your own video clips using a video camera, and play them back on your computer using IBM's Video IN technology. With a video capture adapter installed in your computer, you can use Video IN to capture and store video clips in IBM's Ultimotion or Intel's Indeo formats. Both of these formats provide integrated video and audio support so your video clips can include sound. VideoIN is part of the BonusPak application in OS/2 Warp 4.

6.2.6 OpenDoc - Multimedia in a Document

OpenDoc is a method of combining multiple types of information such as text, graphics, voice, image and video into a single compound document, which can then be stored or exchanged with other systems that implement OpenDoc. The OpenDoc standard is supported by a variety of different vendors, including IBM and many UNIX vendors.

Using OpenDoc is as simple as dragging and dropping different components such as video clips, sound, and text together into a single *root* document. Since OpenDoc is object-oriented, components are identified as objects on the desktop, and you can drag them and drop them in the same way as other Workplace Shell objects. This means that, when creating a document using OpenDoc, you need only focus on the appearance and content of a document, and not concern yourself with the underlying format of each component.

Since OpenDoc is fully integrated into the Workplace Shell, there is no program manager or central starting point for OpenDoc. When you create an OpenDoc document, it simply resides in a folder just like any other object in the Workplace Shell. To help you get started, templates for OpenDoc components and a program object to help you set your OpenDoc preferences are located in the OpenDoc for OS/2 folder within the Utilities folder, which itself resides inside the Programs folder on your desktop.

OpenDoc is well-documented in the *OpenDoc Guide*. You can use all of the sample multimedia objects installed with OS/2 Warp 4 to become familiar with OpenDoc.

6.3 Multimedia for DOS and Windows Applications

Under normal circumstances, DOS and Windows multimedia applications will run under OS/2 Warp 4 without requiring any special measures. However, if you have a Windows application that does not run correctly after being migrated at OS/2 Warp 4 installation time, reinstall the application under WIN-OS/2.

If you still have problems, we recommend that you configure the following DOS and WIN-OS/2 settings for your multimedia application:

```
DPMI_MEMORY_LIMIT                8
INT_DURING_IO                    ON
HW_TIMER                         ON
VIDEO_SWITCH_NOTIFICATION        ON
VIDEO_8514A_XGA_IOTRAP           OFF
VIDEO_RETRACE_EMULATION          OFF
```

For more information on DOS and WIN-OS/2 settings, see Chapter 8, "How to Run DOS Applications" on page 733, Chapter 9, "How to Run Windows Applications" on page 755 and Appendix E, "DOS and WIN-OS/2 Settings" on page 1019.

If your Windows-based multimedia applications do not produce sound, you may find that the WIN-OS/2 Fast Load option is causing the problem. This is because the Fast Load option works by loading a background WIN-OS/2 session when you boot OS/2 Warp 4. If this session takes control of certain adapters such as an audio adapter, it may prevent other Windows applications from accessing the adapter. Try turning off the Fast Load option. Also see Appendix D, "Win-OS/2 Audio Drivers" on page 995 for information regarding audio support in a WIN-OS/2 environment.

6.4 Developing Multimedia Applications

OS/2 Warp 4's multimedia support provides a rich environment for developing multimedia applications and games. These applications typically require high-speed animated graphics.

OS/2 Warp 4 allows such applications to include rapid screen updates and full-motion video subsystems, through the Direct Interface Video Extensions (DIVE) programming interface. DIVE allows applications to write directly to video memory that use a built-in Bit Block Transfer (BitBLT) module for high-performance screen update, image scaling, color space conversion and bank-switch display.

Full discussion of the DIVE programming interface is beyond the scope of this book. If you require further information on DIVE and its implementation under OS/2 Warp 4, you should refer to publications that deal with the DIVE programming interface.

Chapter 7. The VoiceType Dictation Function

This chapter covers the VoiceType function available with OS/2 Warp 4. It provides details on the following:

- Capability of the speech recognition function
- Installation, configuration, and enrollment process
- Usage of the navigation and dictation function
- Customization of the product to specific environments

The VoiceType function is available with the following language versions of OS/2 Warp 4:

- U.S. English
- U.K. English
- French
- German
- Italian
- Spanish

The chapter also provides hints and tips on problem determination to achieve the best possible recognition rates.

7.1 Computing with the Power of Speech

Speech recognition is an automatic transcription of spoken words. With speech recognition, a computer will listen to spoken words that are analyzed and converted into written language, or keystrokes and mouse clicks. Very complex tasks, that previously required long sequences of typed commands or mouse movements, can now be accomplished simply by speaking a command.

The new way of interaction with your computer is speech recognition. It allows a person to interact with computers as never before. You can give your computer voice commands to control an application or navigate around your desktop. You can dictate text and transfer it into any application that supports the cut-and-paste function. You can dictate documents, reports and E-mail.

Anyone can benefit from speech recognition. Speech recognition can speed information handling in almost any environment, or wherever people need to dictate or control devices while using their eyes and hands for other tasks.

Managers and executives can take advantage of speech recognition by creating documents without typing. They may continue to delegate most of their typing, but confidential documents could be dictated to the personal computer quickly and

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efficiently. Frequently, a manager speaks several different languages, whereas the secretary does not. In this case, the manager can use a speech recognition product in his second language.

Professionals can take advantage of speech recognition by dictating field-specific words and phrases using optional vocabularies.

Office support staff can work the way they think, concentrating on the actual work and not the typing. This in turn, allows them to maintain their train of thought.

Speech recognition products on the market today can be put into the following different categories:

- Speaker dependent/independent
  - Speaker dependent means that before the users can use the system, they must first train the system how they speak. This process is called enrollment.
  - A speaker-independent system does not require an enrollment process.
- Discrete word recognition/continuous speech recognition
  - Discrete word recognition means that the user has to make short pauses between the words while dictating to the system.
  - Continuous speech recognition does not require the speaker to make pauses between words while dictating.

7.2 VoiceType

The IBM VoiceType Dictation products on the market today are a result of IBM's research in speech recognition that started early in the 1950s. As a result of more than 30 years of dedicated speech recognition research, IBM has the highest accuracy speech recognition engine on the market today.

One of IBM's major competitive advantages is to use *trigrams* in the recognition process. A trigram is a sequence of three words; a bigram is a sequence of two words.

While other dictation products rely on bigrams, IBM uses statistics about trigrams. One word is preferred to another if it is more likely in a sequence of three words. Trigram statistics are individually calculated for special vocabularies as well, which brings the accuracy of VoiceType Dictation well above 90 percent.

7.3 OS/2 Warp 4 and VoiceType Dictation

OS/2 Warp 4 includes VoiceType for OS/2 Warp. The full benefits of the VoiceType products are integrated with this version of OS/2 Warp. Superior ease-of-use is realized by integrating the navigation commands directly into the operating system. Dictation to a dictation application, an OS/2 window, or a Win-OS/2 window can be performed without the need for training.

With the Voice Manager function, you can use voice commands to control OS/2 applications and Windows programs running under Win-OS/2. Voice Manager allows you to vocally navigate through menu bars and objects on the desktop in order to do things such as opening files, launching applications, or going to your favorite place on the Internet.

Macros are used to perform tasks you do frequently. OS/2 Warp 4 provides complete macro support for controls, applications, and dictation. Control macros enable you to use voice commands to navigate. OS/2 Warp 4 contains so many built-in control macros that you probably will not need to create your own. Program macros enable you to automate repetitive tasks within programs. Although OS/2 Warp 4 comes with macros for the most basic menu commands, you might want to create macros for the programs you use most frequently. Finally, dictation macros enable you to copy text that you use frequently into your Dictation Window. For example, you can assign a macro you call *my-address.* By dictating the phrase **my address**, your address will be placed in the Dictation Window.

OS/2 Warp 4 enables dictation to be performed with Quick Dictation, or with a Dictation Window. The Dictation Window is a speech-enabled word processor. You can still use your favorite word processor by dictating into the Dictation Window, and copying and pasting it into your word processor, or you can perform basic editing and printing from the Dictation Window.

OS/2 Warp 4 provides a number of advanced features, including the following:

- Personal objects for storing user information
- User-selectable installation directory (unless you are upgrading from the previous version)
- Backup and restore for user information
- Macro support for applications
- Context-sensitive help
- Included digit and alphabetic macros
- Internal support for hands-free navigation
- Go to sleep and Wake Up commands to allow hands-free operation
- Check installation utility

7.4 Hardware Requirements to Run the VoiceType Function

The VoiceType software in OS/2 Warp 4 does not need a specialized adapter to enable voice recognition. However, previous versions of VoiceType, which were available as separate products from IBM, did require these specialized adapters. The VoiceType Dictation Adapter was required to relieve the computer's main processor of the burden of processing voice dictation and commands that are very processor-intensive operations. The advantage of a specialized adapter was that you could run the VoiceType software on slower processors such as an Intel 80486 processor.

The VoiceType in OS/2 Warp 4 uses commonly available sound cards to to provide speech input, and uses your computer's main processor to handle voice recognition. As a result of this, higher workload is placed on your processor, since it must handle the tasks that the VoiceType Dictation Adapter handled in the past, as well as running OS/2 Warp 4 and your applications. However, the advantage of this approach is that you can have your system voice-enabled and when you are not using VoiceType, the extra processing power is available for normal applications.

For this reason, IBM recommends that you use a computer with at least a 90 MHz Pentium processor if you want to run VoiceType on your OS/2 Warp 4 system.

The following is a list of the minimal hardware requirements for the use of the VoiceType function in OS/2 Warp 4:

- An IBM or IBM-compatible personal computer with at least a 90 MHz Pentium processor
- 256 KB L2 cache memory
- At least 8 MB of available memory (above operating system and other application requirements)
- Any sound card supported by the OS/2 Warp 4

7.5 Programs Available With VoiceType For OS/2 Warp 4

The following section provides an overview of the programs that come with VoiceType for OS/2 Warp 4. Figure 414 shows the icons you receive when you open the VoiceType Program icon.

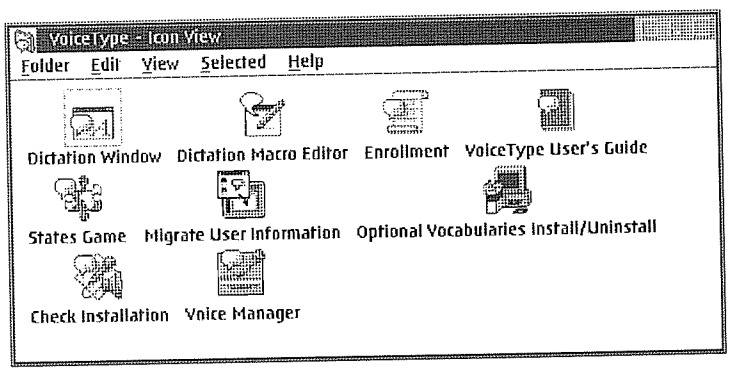

Figure 414. VoiceType - Icon View

- **Optional Vocabularies Install/Uninstall**

  Allows owners of previous VoiceType versions to migrate vocabularies created for that version into VoiceType for OS/2 Warp 4 by using the Optional Vocabulary

Install/Uninstall function. There are different VoiceType vocabularies available in several languages for a number of occupations such as journalism, medicine, etc. For more details, see 7.6.3, "Basic and Additional Vocabularies" on page 724. To install VoiceType Vocabulary on VoiceType for OS/2 Warp 4 for users that have not purchased a previous version of VoiceType requires an upgrade package to obtain this function.

- **Check Installation**

  Allows you to check your installation prior to using VoiceType.

- **Enrollment**

  Is the process of acquainting VoiceType with your speech patterns so that both navigation and dictation speech will be recognized accurately. VoiceType can recognize speech without enrollment for users using OS/2 Warp 4 in their native language but will be affected by accent, background noise, etc. To go through the enrollment process is highly recommended.

- **Migrate User Information**

  Allows users of previous VoiceType versions to migrate the following user information to OS/2 Warp 4:

  - Personal Language Model
  - All user added words
  - User dictation macros

- **Voice Manager**

  Is the *starting point* for using the VoiceType program. The Voice Manager enables you to turn the microphone on and off, display the What Can I Say or Where can I go windows.

- **Dictation Window**

  Can be used to dictate text that you would normally type into a text editor.

- **Dictation Macro Editor**

  Allows you to create dictation macros and templates that can be used with the Dictation Window program.

- **State Game**

  VoiceType for OS/2 Warp 4 comes with a speaker-independent game called the State Game. This simple game tests your knowledge of the United States (see Figure 415 on page 712). You are presented with a map of the United States of America and you are prompted to say the name of a state. The state you say is then shaded in a particular color. Click the **Help** button for a list of states. The game finishes as soon as you have named every state, and you can quit from the program at any time. The European version of VoiceType for OS/2 Warp 4 uses a map of Europe instead of a map of the United States of America.

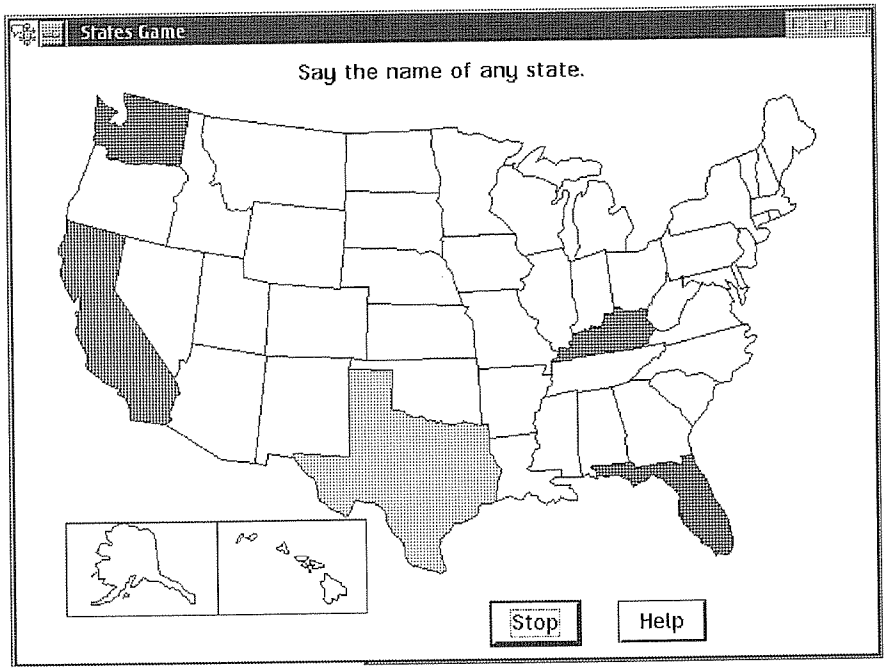

Figure 415. VoiceType State Game

- **VoiceType User's Guide**

  Is a very comprehensive online user guide. Select the VoiceType User's Guide object from the VoiceType folder shown in Figure 414 on page 710 to open the online user guide.

  The online user guide contains detailed information on how to use VoiceType and you should use it extensively, particularly at the beginning. Figure 416 on page 713 shows a list of contents of the *VoiceType User's Guide* provided with VoiceType for OS/2 Warp 4.

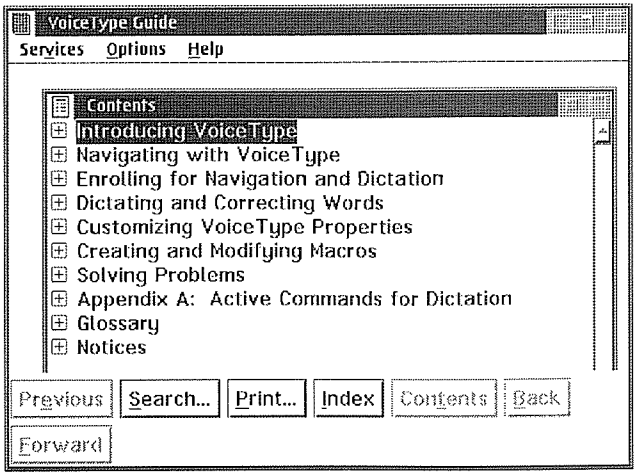

Figure 416. Content VoiceType - User Guide

7.6 Installing VoiceType Dictation

If you intend to install and use VoiceType in your OS/2 Warp 4 system, you need to ensure that your hardware meets the requirements to run VoiceType as described in 7.4, "Hardware Requirements to Run the VoiceType Function" on page 709. VoiceType will be installed automatically when you install OS/2 Warp 4, unless you de-select it from the Optional System Components dialog within the OS/2 Setup and Installation window (see Chapter 2, "Planning and Installing OS/2 Warp 4" on page 15).

If your processor is slower than a 90 MHz Pentium, the installation procedure will warn you that your processor is slower than the minimum recommended configuration, and ask if you wish to continue. You can continue to install VoiceType if you wish, but be warned that it may affect the performance of your OS/2 Warp 4 system, and unpredictable results may occur when running VoiceType.

7.6.1 Checking Your Installation

Prior to using VoiceType, you should check that the installation of your hardware is correct. Ensure that all of your hardware is correctly connected. Be aware that while you have a speech application running, you will see a lot of disk activity. That is because the input from the microphone is being recorded.

- Check that you have your microphone plugged into the line in or microphone socket for your computer. You would normally select the microphone socket.

- Check that your speakers are plugged into the speaker output socket. When you hear system sounds as you start up or when you perform some desktop operation, then you will know that the speakers have been correctly set up.

Once you are satisfied that all is correct, double-click your left mouse button on **Check Installation**. OS/2 Warp 4 will display the Check Installation window, as shown in Figure 417.

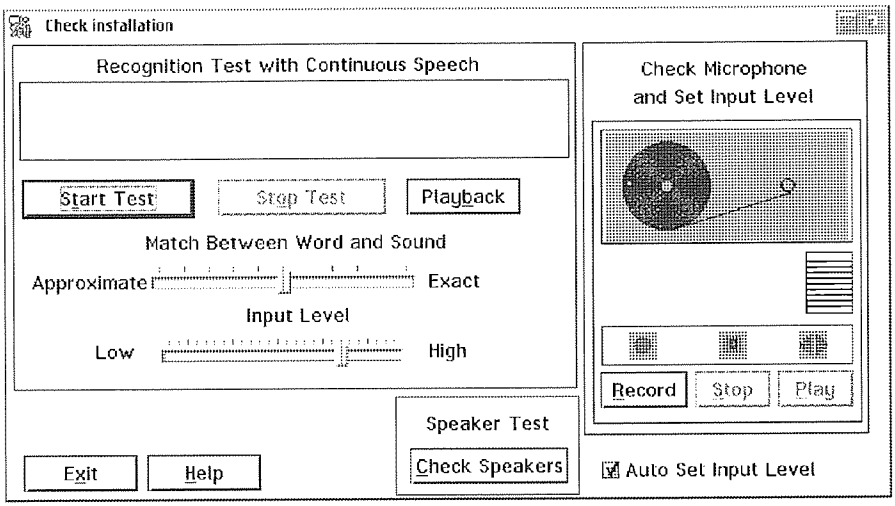

Figure 417. VoiceType - Check Installation Window

The Check Installation window is divided into three sections:

- **Speaker Test**

  Click on the **Check Speakers** button to make sure your speakers are working correctly. Click **Help** for advice on what to check if this test fails. A failure here normally indicates that you have a faulty connection, your speakers may not be powered on, or you have the volume set too low.

- **Check Microphone and Set Input Level**

  Make sure the **Auto Set Input Level** check box is selected and, with the microphone turned on, select the **Record** button. Read something in a normal speaking voice, and VoiceType will record your speech. You will notice the Input Level slider moving until it settles on a particular level.

Note:

Positioning the microphone properly is very important

While recording, keep an eye on the level indicator above the Play button. It should be in the lower green color.

When recording is complete, select the **Play** button and you should hear what you have recorded clearly. If it is not clear, your microphone may not be sensitive enough. At this stage, just keep any problems in mind and proceed.

- **Recognition Test with Continuous Speech**

  This will test whether the voice recognition software is functioning correctly. When you select the Start Test button, words will appear on the screen. Simply repeat these words. If you have difficulties, you can turn down the Match Between Words and Sounds slider. If you need to turn this slider down, keep that fact in mind when you continue to the enrollment phase.

When you exit the Check installation window, the system will ask whether you want to save the input level and match level established.

At this point you can play the State Game shown in Figure 415 on page 712 to test the default recognition. Do not be disappointed if the results are not good, as they will dramatically improve after going through the enrollment process.

7.6.2 VoiceType Enrollment

The enrollment process teaches the VoiceType how to recognize your speech patterns with greater accuracy. For the VoiceType in OS/2 Warp 4 the enrollment process is normally not required for users that have installed their own native language version of OS/2 Warp 4. For example, a native German speaking user does not necessarily need to go trough the enrollment process when working with a German version of OS/2 Warp 4. However, if you start the navigation and/or dictation function without enrollment and you find that VoiceType needs to improve the recognition accuracy of your speech, completing the enrollment process is highly recommended. You should also enroll:

- If you think your speech pattern, perhaps resulting from a regional accent, might be difficult for VoiceType to interpret
- If you find that VoiceType does not recognize your words correctly

When you enroll, you must do so separately for commands and dictation. However, each can be part of the same enrollment.

There are actually two enrollments, one for the navigation and the other for the dictation function.

The navigation function allows you to use voice commands to move around your desktop, to manage files, folders and windows and to work with your programs. Navigation requires continues speech.

The dictation function allows you to dictate text and requires you to speak with short pauses between words while dictating. Both the enrollment process for navigation and dictation use a two-stage process consisting of:

- Recording

  Reading out 283 short sentences displayed on the screen for dictation in discrete and 170 commands in continuous speech. You can complete the minimum set of recording, which is 50 sentences, in about twenty minutes.

  Note:

  The most benefit is received with the first 50 sentences, so there is absolutely no need to go through all 283 sentences for the dictation, or 170 sentences for the navigation enrollment.

- Training

  After you complete the recording process, training instructs VoiceType to analyze the words you recorded. When you complete the training, VoiceType becomes familiar with your personal speech pattern and the environment in which you use voice commands and dictation. Depending on how many sentences or phrases you record, and the speed of your processor, training could take from one-half to a few hours. We suggest that you start the training of your recordings at the end of the day so that the computer can complete the enrollment process overnight.

If you encounter problems with voice recognition during the State Game or the Check Installation process, you might find that you will also have problems with words not being recognized during enrollment. In this case, you should consider clicking the **Options...** button. This will display the Enrollment Options dialog, as shown in Figure 418 on page 717.

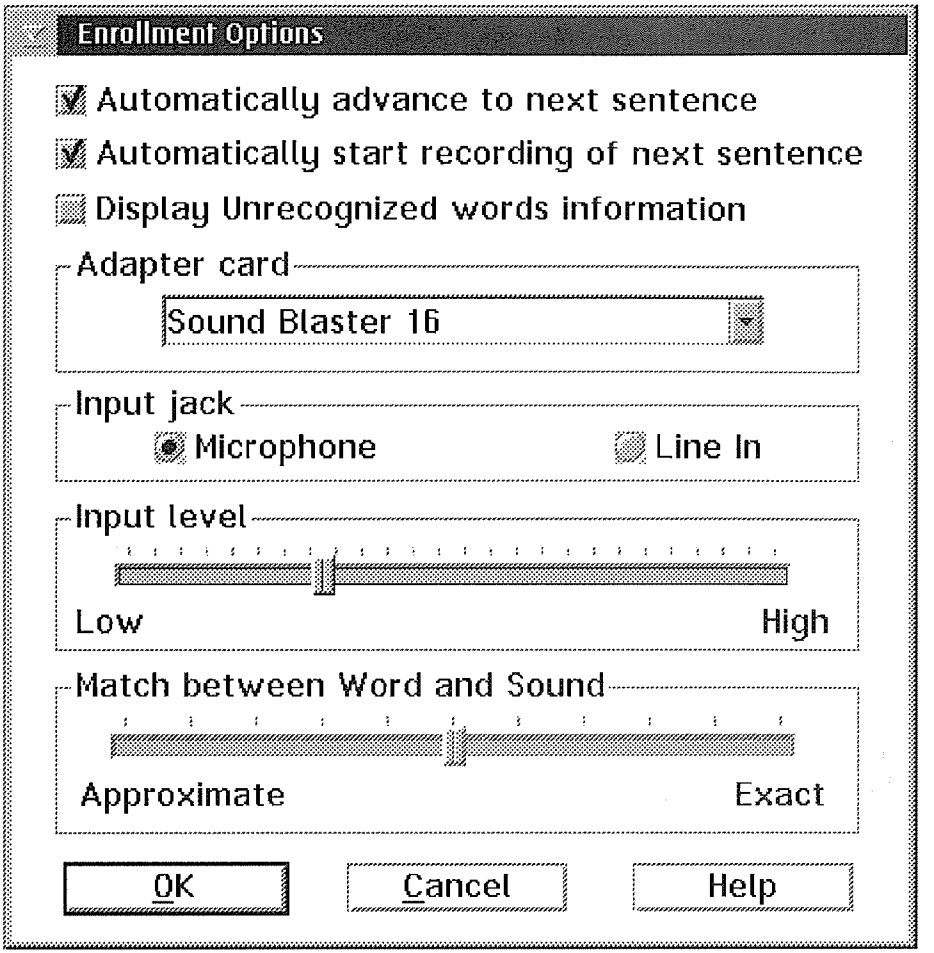

Figure 418. Enrollment Options Window

If you find that VoiceType cannot recognize many words that you speak, you can move the Match between Word and Sound slider toward Approximate. The quality of the voice model resulting from your enrollment is determined by this setting, so you should try to keep the slider as close to Exact as possible. After you are more familiar with VoiceType, you may well enroll again with a more exact setting.

You may also find that the volume of your voice is insufficient for VoiceType to recognize your speech easily. This is normally indicated by the Audio Level indicator not being in the middle to high *green* range. If this is the case, you can adjust the Input Level slider.

7.6.2.1 Preparing for the Enrollment

The accuracy of the speech recognition that you do in all the speaking you do after the enrollment is highly dependent on this enrollment stage. You need to:

- Pronounce your words in the way you would say them when normally speaking. Accents are tolerated as long as they are not too far apart from accent-free speech.
- Speak in *isolated speech* for the dictation enrollment.
- Use the same microphone that you intend to use in your work environment.
- Enroll on the same personal computer that you intend to use in your work environment. Although the speech files are transferable from one computer to another, there is an individual noise that certain machines have that will be taken into consideration during enrollment.
- Enroll with the same background noise that you will have on the working system. If you work in a noisy office, then an enrollment in the quietness of your own home may not be the ideal environment.
- If you enroll while suffering from a cold, then your voice will be different from when you are feeling well. If you know that you frequently catch a cold, you might enroll twice, one time with your normal voice and another time with hoarseness brought on by a cold.
- If you are using a laptop, it is recommended that you use the power supply and not the laptop's internal battery to enroll.
- If you already have an existing enrollment and would like to create a more accurate voice model, then moving the scroll box in Match Word to Sound to Exact will do this. The enrollment may take longer, as you are bound to encounter red words, but the accuracy of the speech recognition once you are using it will be improved if you manage to speak in the same way when dictating.

7.6.2.2 The Enrollment Process

Once you have decided to enroll, you need to determine when to enroll. It is best to choose a time when you will not be using your computer (in the evening, for example). The reason for this is very simple: the enrollment process consists of two stages:

- Reading out a minimum number of 50 sentences out of 272 (dictation), or 50 commands out of 170 (navigation) displayed on the screen
- Analysis of your recorded sentences and building your voice model

The latter requires all available computer power and has to be done at one time or in one sitting. The time taken for this process is about 90 minutes minimum, and it varies considerably from one computer to another. It could take several hours to complete processing. So, starting the analyzing process of your recording in the evening makes a lot of sense.

Before you start the enrollment process ensure that all other speech applications have been shut off.

To start the enrollment process, click on the **Enrollment** icon in the VoiceType - Icon View window. This will bring up the VoiceType Enrollment window shown in Figure 419 on page 719. Verify that your User Profile name is listed in the User Names window. If you do not have a user profile listed, select **Create**, type in a user name and again select **Create** to create a user profile. After this, select your user profile in the VoiceType Enrollment window and click on **Enroll** to start the enrollment process.

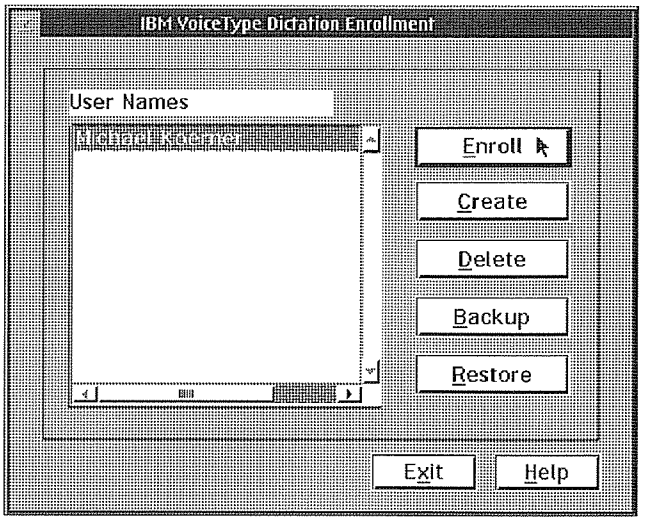

Figure 419. VoiceType Enrollment window

Now you have to decide whether to go first to the navigation or dictation enrollment. The navigation enrollment should be done first, as it does not require you to dictate in isolated speech. Select **Navigation** or **Dictation** on the User Profile Enrollment's window shown in Figure 421 on page 721 and select **Start**. This will bring up the Navigation or Dictation Enrollment Sample window shown in Figure 422 on page 721.

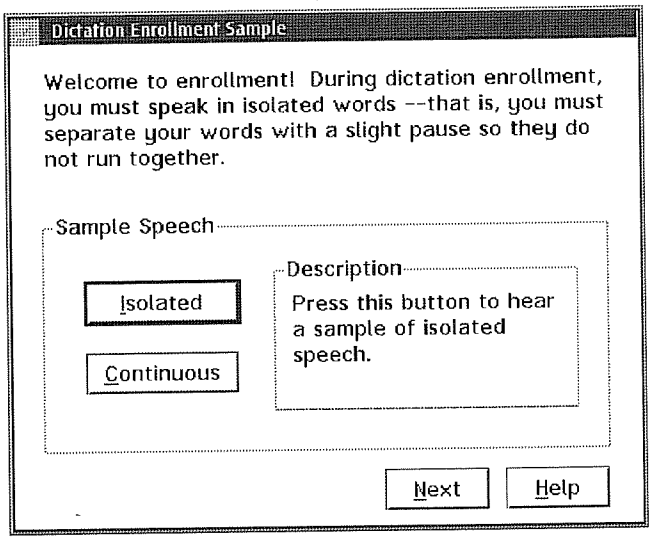

Figure 420. Dictation Enrollment Sample Window

The Dictation Enrollment Sample window presents an introduction to the enrollment session. The push buttons allow you to hear examples in isolated or continuous speech. After the examples have been played, a Try Speaking button appears. Select this button to continue the enrollment session. Select **Next** to skip the speech examples and go directly to the Enrollment window.

Figure 422 on page 721 shows the Enrollment-Main Panel. Select **Start** to start the recording process. A minimum number of 50 sentences must be recorded before the analyzing process can be started. If a word cannot be recognized by the system, it will be marked red and the unrecognized phrase or word window shown in Figure 421 on page 721 appears.

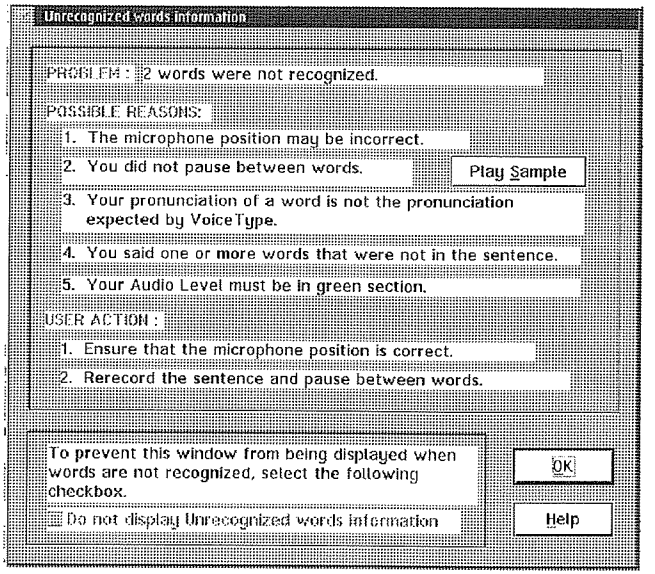

Figure 421. Unrecognized Word Information Window

You can then either repeat the recording or select **Next** to continue with the next phrase or sentence. Continuing without recording unrecognized phrases or words might result in a negative impact on your recognition rate.

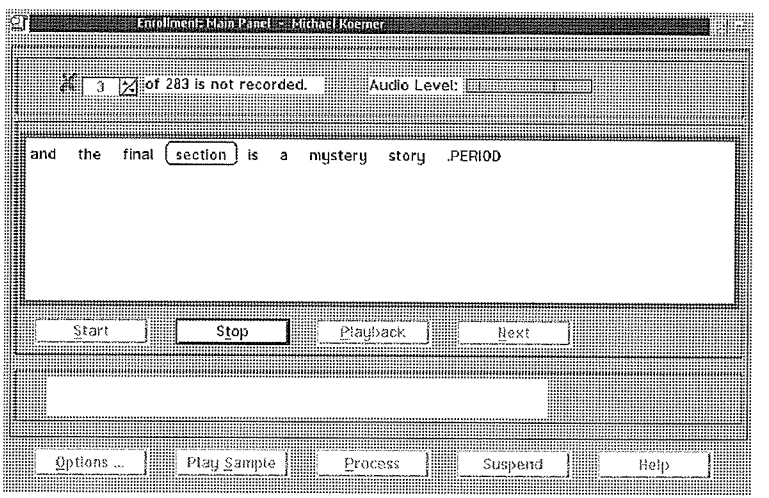

Figure 422. Enrollment-Main Panel

You can suspend the enrollment process at any time by selecting **Suspend** and proceed with the enrollment session at a later time.

7.6.2.3 How to Move Your Enrollment to Another System

Without any problems, you can use your personal speech model on any other system with VoiceType for OS/2 Warp 4 installed. All you need to do is simply back up your speech files as described in the following section.

Backing up Your Speech Files: VoiceType for OS/2 Warp 4 initiates backup of speech files through the enrollment panel. On starting up enrollment and selecting the user whose speech files you want to back up, one of the options in the enrollment panel is to back up or restore your enrollment. All you need to do is have 3.5-inch diskettes ready and select the **Backup** button. You can always restore the files on any OS/2 Warp 4 system with VoiceType installed to use your specific enrollment.

The backup/restore process will also back up and restore words and macros added previously to the vocabulary.

7.6.2.4 Problems with Enrollment Processing

Too Many Red Words: During standard enrollment, everyone will get some red words. This could be because you slurred your speech or your pronunciation was not accurate or the microphone may have picked up additional noise. If red words occur on every sentence and you do not feel you are making a great deal of progress on your enrollment, then you need to make the following checks:

- Adjust your microphone so it is situated one inch away from the corner of your mouth.

  Note:

  Ensure that the microphone is not located directly in front of your mouth.

- Ensure that the volume display is in the green section when you speak the word. Check to see whether saying the words louder improves matters.
- Click the **Playback** button to determine what noise the system is processing. If the recorded sentence indicates that the microphone is picking up extra noise, then you need to access the Enrollment Options menu by selecting the **Options** button and changing the gain of the microphone.
- If, on saying the same sentence again, different words appear in red, then you need to access the enrollment options panel through the Options button and move the Match Word to Sound slider bar towards Approximate. This makes the enrollment program less fussy about your way of talking.

Note:

You should only adjust the slider bar towards Approximate one tick at a time. The degree of match should be adjusted on the first sentence until satisfactory. Then you can complete the enrollment.

- If, on saying the sentence again, you realize that the same word turns red in a number of different sentences, then the pronunciation of the word is not one of the expected pronunciations. If the sentence sounds correct and you have moved the slider bar on the Match Word to Sound all the way to Approximate, then the only option you have left is to skip the current sentence and proceed with the next.

Recommendations before Processing Enrollment: Once you have completed the enrollment stage and choose to proceed with the processing, it may be worth backing up your sentence files. These are the files that hold all the speech information relating to your enrollment. The files can occupy between 7 to 20 MB of disk space. They are located in the following directory:

```
C:\VT\SPCH_RUN\<userid>\ENROLL
```

You can copy the files contained in the above directory to diskette or to some free space on your local drive. This is a very important step, as you may at a later stage encounter a problem with enrollment processing that may result in having to do another enrollment. These files are erased during enrollment processing, so backing up the speech files at this stage may prevent you from going through the sentence-reading stage of the enrollment again, should you be required to re-enroll.

Enrollment Processing: Enrollment processing is initiated by clicking **Yes** in the panel that you are offered when you are done speaking the last sentence. It is safe to click **No** here and to resume later, if you need to do some other work on your computer or have to switch it off. Once you have initiated processing, however it can take anywhere from one-and-a-half hours to several hours. The length of the processing is very much dependent on the number of sentences recorded and the speed of your processor. Once started, an enrollment information panel is displayed. The most important feature of this panel is the Status bar, which gives the progress of the enrollment. The progress is measured as a percentage rate. But the enrollment program holds this information as a series of steps. If the progress bar does not change for a period of about 30 minutes, then you need to determine whether the processing has ceased. The section below discusses the enrollment processing and gives you some guidelines on how to solve any problems that may occur at this stage.

On completion of the enrollment processing, a panel will appear indicating successful completion of your enrollment. You are now ready to start using VoiceType.

What VoiceType has done during enrollment is take your voice information which you supplied during the sentence reading at the beginning and built a voice model based on

your unique vocal patterns. A voice model is a collection of files stored in the following directory path:

```
C:\VT\SPCH_RW\USERS\<userid>
```

<userid> is usually the name specified when you were asked to enter user information at the very beginning of enrollment. You need to be aware of these voice model files, and you should back up these files on a regular basis using the backup function described in "Backing up Your Speech Files" on page 722.

Problems with Enrollment Processing with OS/2 Warp 4: If processing/training fails, then the <ENROLLMENT>.SEF file will show the steps that have completed and the failing step. This file is located in:

```
C:\VT\.SPCH_BSF\USERS\<USERID>\<USERID>.LOG
```

The following file is also generated when a severe error occurs during enrollment processing. This is called the <USERID>.LOG, and it is stored at the following location:

```
C:\SPCH_RUN\<USERID>\TRAIN.LOG
```

7.6.3 Basic and Additional Vocabularies

VoiceType provides a 22,000-word vocabulary of U.S. English words, and can be expanded up to 65,000 words. The other languages offer between 30,000 (U.K. English and German) and 42,000 (Spanish) words in the base vocabulary and can be complemented by personal words or commands that a user uses frequently, up to an overall of 65,000 (U.K. English: 59,000). If your work requires field-specific words, there are vocabularies available for certain languages, including the following:

- Emergency Medicine - U.S. English
- Gynecology - German
- Journalism - U.S. English
- Legal - German, Italian, Spanish, U.K. English, U.S. English
- Orthopedics - German
- Radiology - French, German, Italian, U.K. English, U.S. English
- Pathology - German, Italian, U.K. English
- Local Government - Italian
- Internal Medicine - German
- Ear/Nose/Throat - German
- Accident Surgery- German
- Legal and Business - German
- General Medicine - Spanish
- Cardiology - French

- Reports and Documents - French

The vocabularies listed above are called Industry-Language Models (ILMs), and are available as separate products. You can install Industry-Language Models by selecting the **Optional Vocabularies Install/Uninstall** (must be purchased as an upgrade) icon form the VoiceType - Icon View window. The program will then automatically install the Industry-Language Models from a CD or diskette to your computer system.

7.7 The Navigation Function

The navigation function lets you use voice commands to move around the OS/2 desktop, to manage files, folders and windows and to work with your program. The navigation function requires you to start the Voice Manager of VoiceType.

7.7.1 Using the Voice Manager

You can start the Voice Manager by double-clicking your left mouse button on your **Speech User** icon or the **Voice Manager** icon. If you start the Voice Manager and there is more than one user or enrollment on your OS/2 Warp 4 system, VoiceType will use the enrollment and user that last used VoiceType. To be sure that you use the correct enrollment, you should start the Voice Manager by clicking on your **Speech User** icon.

After starting the Voice Manager, you will see the Voice Manager window as shown in Figure 423.

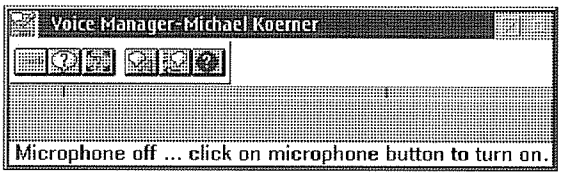

Figure 423. Voice Manager Window

VoiceType will also display the What Can I Say window, as shown in Figure 428 on page 732.

The Voice Manager window contains the following buttons:

- **Microphone**

  Graphically displays the microphone status.

  On and Off states toggle when you click on the microphone button, or when you press the Shift key twice. To use VoiceType, you must ensure that the microphone is turned on.

Sleep indicates that the microphone is still on, but VoiceType responds only to words under the While Sleeping heading in the What can I say window.

If VoiceType encounters an error condition, a circle with a diagonal line through it will appear over the microphone button.

When you issue a voice command that requires a delayed response, a clock is displayed over the microphone button.

You will also see a similar button on the currently active window when VoiceType is running. You can use this button to turn the microphone on and off.

- **What Can I Say**

  Displays the What Can I Say window, as shown in Figure 424.

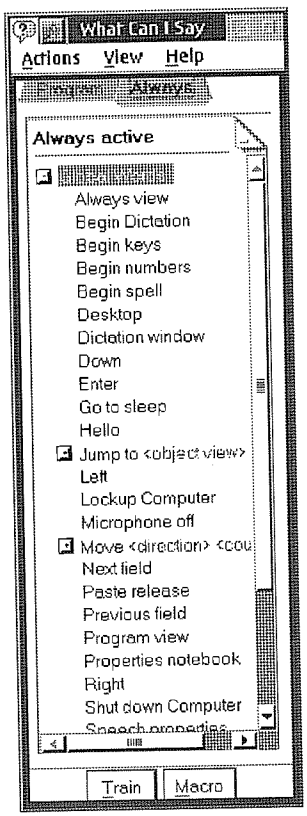

Figure 424. What Can I Say Window

This window contains two pages of commands that you can say, depending on your position on the desktop. One page lists actions you can say at any time, while the

other page lists actions that are specific to the object, program, or menu with which you are working.

- **Where can I go**

  Displays the Where can I go window. This window contains a list of objects that you can open or start by using your voice.

- **Dictation Window**

  Displays the Dictation Window, in which you can use your voice rather than your keyboard to create letters and other documents.

- **Voice Manager Properties**

  Displays the VoiceType Properties notebook, where you can make changes to VoiceType in order to reflect your personal preferences and work habits.

- **Help**

  Displays online help for the Voice Manager software.

In the middle of the Voice Manager window, there is an Input Level indicator. When you speak, your voice should be in the middle *green* level. If there is insufficient volume, the indicator will be in the bottom *yellow* section and if the volume is too high, it will be in the top *red* section. You can adjust the level in the Audio tab of the Voice Manager Properties notebook.

7.7.2 Using the Navigation Function

The navigation function lets you use voice commands to move around the OS/2 desktop, to manage files, folders and windows and to work with your program. Before you begin speaking, look for a blue border around the active window, called speech highlighting. The border is blue by default; you can customize the color. Speech highlighting is active only if the microphone is switched on. The blue border highlights the window that is receiving voice commands. To switch to another window you need to:

- Click on the window, or
- Say **window list** to view a list of available windows, or
- Say the name of the window you want to open

When you speak navigation commands, do not pause between words.

If you have problems in constantly misrecognized navigation commands, you can double-click on the word in the What Can I Say window, then train the word. This will add the word with your own pronunciation to the navigation vocabulary.

7.7.3 Working through the Tutorial

At this point, the Voice Manager should be active. You can either use your mouse to open the OS/2 Warp 4 Tutorial object, or use the following voice commands. Make sure your microphone is switched on, then state the following commands:

1. Say **desktop** to switch focus to the Workplace Shell desktop.
2. Say **Assistance Center** to select the Assistance Center.
3. Say **open** to open the Assistance Center folder.
4. Say **open OS2 Warp tutorial** to start the OS/2 Warp 4 Tutorial. You should now see the Tutorial window.
5. Say **VoiceType** to start the VoiceType Tutorial.
6. Say **basics** to start the first section of the tutorial.
7. After you have read the first page and you would like to proceed, we suggest that you move through this tutorial page by page. You can say the name of a topic which will take you there directly, but you might skip some important information. Say **forward** to go to the next page and **backward** to see the previous page.

Throughout the tutorial, you have the opportunity to practice what is being shown. When you see the Practice button active, just say **practice** and follow the instructions.

There are also notes and tips available. When you see the Notes & Tips button active, just say **notes and tips** and you will see the advice.

After you complete the tutorial, you should have enough knowledge to take advantage of VoiceType. You will know how to navigate and how to dictate, and be well on your way to talking to your computer rather than typing.

7.8 The Dictation Function

The VoiceType function in OS/2 Warp 4 enables dictation to be performed with Dictation Window or Quick Dictation.

- Dictation Window

  Dictation Window is a speech-enabled word processor. You can still use your favorite word processor by dictating into the Dictation Window, and cutting and pasting it into your word processor, or you can perform basic editing and printing from the Dictation Window.

- Quick Dictation

  Quick Dictation is used for transferring text to an open application. With Quick Dictation, you first bring to the foreground the program that you want to transfer the text into. Then launch the Quick Dictation by saying **begin dictation**, and simply start dictating your text into the Quick Dictation Window. Click on the **Send** button, and your text will then appear in the application that you selected.

7.9 Customizing Your Speech Environment

Your VoiceType product is ready for use when you have installed it and, if necessary, trained it to your speech by going through the enrollment procedure. The VoiceType products come with a set of commonly used words named vocabulary. Training a system to your speech means that these words will be recognized with high accuracy.

But just as you ease your work at the computer by organizing the icons for your most frequently used programs on the desktop of your display, you may want to customize your VoiceType by teaching it spoken commands to control these programs. In the same way you organize your text-processing software by generating document layouts, etc., you may want to customize your VoiceType by teaching it spoken commands for your document layouts and formats.

For this purpose the VoiceType products have included macro programming facilities. A macro is a sequence of activities that your computer performs and which you can invoke by a simple command. VoiceType macros are invoked by spoken commands. VoiceType offers the following macros:

- Control macros
- Dictation macros

Control macros enable you to customize your desktop and control your work environment by spoken commands. A control macro such as battery-indicator could automatically force the system to display the power status of your portable computer. Such a control macro would be especially useful when you work disconnected from the power supply, have lots of windows open on your desktop and cannot see the battery icon beneath the open windows.

Dictation macros enable you to customize your Dictation Window and to speak formatting information right in the middle of dictating text.

7.10 Customizing Speech for Your Desktop

When you use your computer with a graphical user interface, you are using it to activate objects on the desktop by mouse clicks, keystrokes, or a combination of both. Providing a control macro means giving your sequence of actions a unique name and enabling VoiceType to perform the actions when you speak the name. For this purpose, VoiceType provides a macro recording facility. You will now learn its use in the example of a macro named *jump-to-battery-indicator*. Imagine you are working disconnected from your power supply and want a fast check of the battery. When you say **jump to battery-indicator**, the macro pops up a window to the desktop that indicates the power status of your portable computer.

7.10.1 The Battery-Indicator Example

Once Voice Manager is activated, you can jump to an object listed in the Where can I go window. To add the battery indicator to the Where can I go window, first open the battery object notebook to the Speech page, as shown in Figure 425.

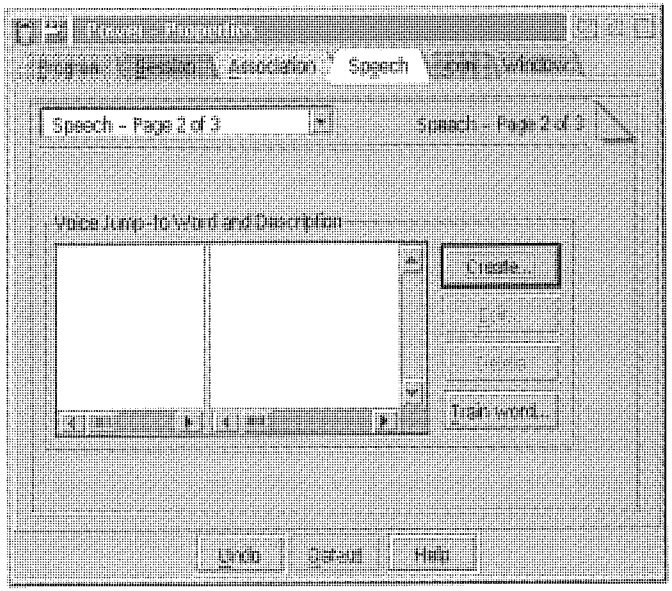

Figure 425. Speech Properties, Page 2 of 3, Adding a Jump-to Word

Click the **Create** button, and the dialog shown in Figure 426 on page 731 is displayed. Enter the name that you wish to call this object, the description, and the action you want to occur. Since you want to start the battery-indicator object, your action would be Open. The drop-down list shows other possible actions that can occur when you jump to the object.

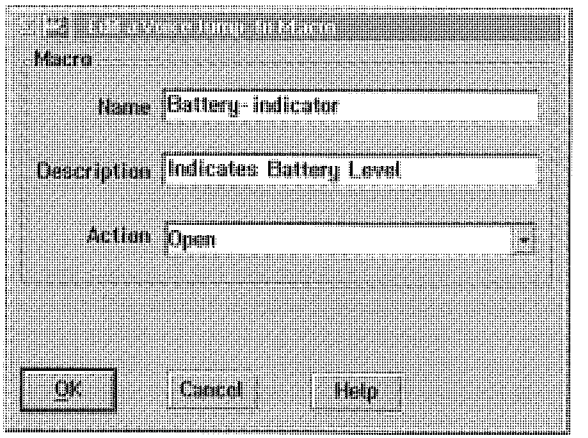

Figure 426. Creating a Jump-to Macro

Once the macro is created, the jump-to list is updated in the Where can I go window, as shown in Figure 427. Now simply say **Jump to battery-indicator** and your battery indicator will start.

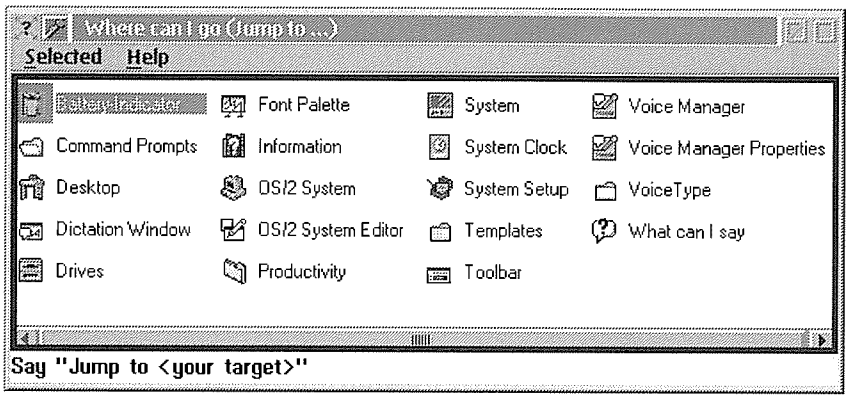

Figure 427. Updated Where Can I Go Window

If you wanted to add a control macro that would send a set of keystrokes and pauses to your application, you would use Speech Properties, Page 1.

7.11 Trouble Shooting Your Speech Environment

The VoiceType program in OS/2 Warp 4 has several very useful log files that can be used for debugging speech-related problems:

- Speech engine log file

  The speech ENGINE.LOG file provides details on all activities in the VoiceType speech engine. The ENGINE.LOG file is located in:

  `X:\VT\SPCH_RUN`

  To activate the speech ENGINE.LOG file add the following line into the ENGINE.CFG file under defaults, as shown in Figure 428:

  `API_LOG_LEVEL = 2`

  The speech engine file ENGINE.CFG is turned off by default and located in:

  `X:\VT\SPCH_BIN\ENGINE.CFG`

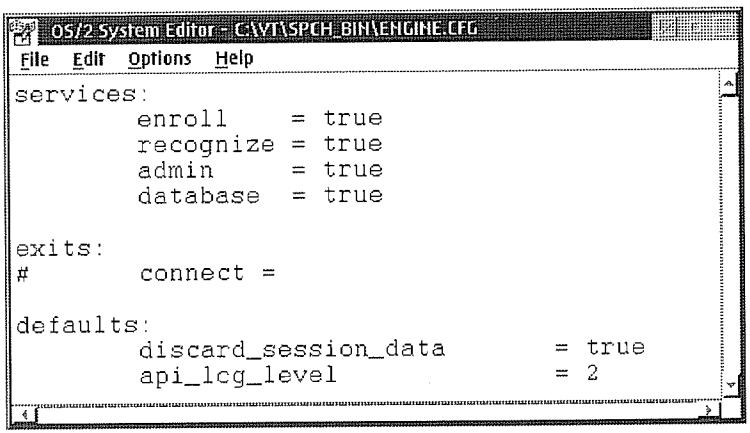

Figure 428. Speech Engine Log File Activated

- Dictation Macro Editor

  Details on problems with the Dictation Macro Editor can be found in the DME.LOG file. The DME.LOG file is always turned on by default.

- Navigator errors

  Details on problems with the Navigator can be found in the WW.LOG. The WW.LOG is always turned on by default.

Both the DME.LOG and the WW.LOG files are located in:

`X:\VT\SPCH_RUN`

Chapter 8. How to Run DOS Applications

OS/2 Warp 4 allows you to run your DOS application software in a multitasking, protected environment, alongside other DOS, Windows, and native OS/2 applications. You can run a DOS application in a full-screen session or, depending on the screen-resolution requirements of the application, in a window on your desktop.

8.1 Operation

The Intel 80386 processor introduced a feature known as *virtual 8086 mode*. When running in this mode, the 80386 behaves as though it were many separate computers, each with its own 8086 processor. Since DOS was originally designed to run on an 8086 processor, each of these virtual 8086 processors can be used to run DOS or OS/2 applications.

Although virtual 8086 mode was introduced with the 80836 processor, the same mode is present in the 80486 and Pentium processors. OS/2 Warp 4 uses this mode to provide an environment in which you can run multiple DOS applications.

Since the virtual 8086 mode directly emulates an 8086 processor, you can run not only DOS and OS/2 applications, but also any other operating system and/or application that is designed to run on an 8086 processor. See 8.5.4, "Other Operating Systems" on page 749 for more information.

8.1.1 Virtual DOS Machines

OS/2 Warp 4 takes the virtual 8086 execution mode of the Intel processor, and adds some extra "virtualization" to the environment. Virtual 8086 mode provides a virtual processor, but OS/2 Warp 4 adds memory management and virtual devices to create a complete execution environment, where the DOS application "thinks" it is running in its own computer, with complete control over the processor, memory and devices. In fact, this is not the case since OS/2 Warp 4 still exercises full control over the application, allowing a very high level of application compatibility.

The complete execution environment for a DOS application under OS/2 Warp 4 is called a *virtual DOS machine* (*VDM*). The VDM consists of:

- A full set of virtual system resources
- Virtual processor,
- 640 KB base memory area (known as an *address space*),
- Virtual devices.

  OS/2 Warp 4 manages the environment on the application's behalf.

The major advantage of the VDM concept, apart from the ability to run in a multitasking, protected environment, is that each application runs in its own unique environment, and

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each environment can therefore be uniquely configured to match the needs of the application. See 8.4, "Tuning the Application Environment" on page 740 for further information on how to configure and tune a VDM.

8.1.2 The DOS Redirector

While the VDM appears, in reality there is no DOS at all from the application's viewpoint, just like a computer running DOS. The services that would normally be performed by DOS are actually performed by OS/2 Warp 4 itself. In place of the DOS operating system, each VDM contains a small (around 4 KB) redirector module that accepts DOS requests from the application, and routes them to OS/2 Warp 4 modules outside the VDM, where the requests are carried out. The results are then returned to the application via the redirector. The benefit of using a redirector module in this way is that the VDM's 640 KB memory space is not taken up by large amounts of DOS code, and you therefore have more memory available for your applications and data. You can therefore avoid the typical DOS "RAM cram" problem, which occurs when your computer's base memory is taken up by DOS and its device drivers, leaving insufficient room for your applications and data.

With the default VDM configuration, you get around 630 KB of free memory, though this may be reduced if you load device drivers or other memory-resident programs into the VDM.

8.1.3 Device Drivers

The DOS emulation provided by OS/2 Warp 4 includes a number of standard device drivers, which are loaded outside the VDM's 640 KB memory space.

These are:

- Video
- Keyboard
- Mouse
- Printer
- Serial port

These drivers are known as *virtual device drivers (VDD)*, since they do not communicate directly with a device. Instead, they communicate with the standard OS/2 Warp 4 device driver, allowing multiple programs to access devices such as the screen and keyboard. Loading these device drivers outside the 640 KB address space means that you save additional memory within the address space, which you can then use for applications and data.

If you have additional devices that you need to access from within a VDM, you can load normal DOS device drivers and memory resident programs into a VDM. See 8.4, "Tuning the Application Environment" on page 740 for information on how to do this. Note, however, that these drivers and programs *will* use memory within the 640 KB address space.

Note:

Do not use the DOS high memory area driver HIMEM.SYS in a DOS session under OS/2 Warp 4. Depending on the configuration of your hardware, using this driver can crash your system. You can still use the high memory area for DOS sessions under OS/2 Warp 4, using the DOS_HIGH, DOS_UMB and XMS_MINIMUM_HMA settings.

8.1.4 Using Memory Extenders

Many DOS applications require more than 640 KB of memory, and use special techniques known as *memory extenders* to access additional memory. Most memory extenders use one of the following interfaces:

- DOS Protect Mode Interface (DPMI)
- Expanded Memory Specification (EMS)
- Extended Memory Specification (XMS)

OS/2 Warp 4 supports all of these interfaces within its own DOS emulation, so applications that use any of these interfaces can run under OS/2 Warp 4, without the need to load the memory extender into the VDM. This means you can save additional memory within the 640 KB address space, while still accessing additional memory for your application.

The memory provided to an application by OS/2 Warp 4 using these interfaces is just normal system memory. OS/2 Warp 4 allows the application to access this memory as if the application were running under DOS and using a normal memory extender. If you wish, you can use more than one interface in a single VDM, though most applications only use one interface.

You can regulate the amount of memory available to a VDM through any of the three supported interfaces. This is explained in 8.4, "Tuning the Application Environment" on page 740.

8.2 Installing DOS Support

DOS Support is normally installed when you install OS/2 Warp 4. If you choose the **Easy** installation option, you will automatically install DOS support. If you choose the **Advanced** option, you can choose whether you want to install DOS support. Under the default option, however, DOS support will be installed.

Note

You must install DOS support if you wish to install WIN-OS/2 and run Windows applications under OS/2 Warp 4.

If you have already installed OS/2 Warp 4 and did not install DOS support, but now want to run DOS applications under OS/2 Warp 4, you can install DOS support using the Selective Install utility.

To start the Selective Install utility, insert your OS/2 Warp 4 CD-ROM in your CD-ROM drive, and follow these steps:

1. Open the **OS/2 System** folder on your desktop
2. Open the **System Setup** folder
3. Open the **Install/Remove** folder
4. Double-click your mouse on the **Selective Install** icon to start the Selective Install utility

The first two screens deal with your hardware configuration. On the third screen, you will see a list of installation options including DOS support. Note that this is the same screen that you saw when you first installed OS/2 Warp 4.

5. Click your mouse of the check box to the left of the **OS/2 DOS Support** list item.
6. Then click the **Install** button.

When the installation has completed, you will need to reboot your system before you can run DOS applications, since the installation makes some changes to your OS/2 Warp 4 configuration files. Simply follow the instructions given to you by the Selective Install utility.

Note that when you use the Selective Install utility, OS/2 Warp 4 will ask you whether you wish to add existing DOS and Windows programs to your OS/2 Warp 4 desktop. Selecting this option will automatically invoke the Add Programs utility (see 8.3, "DOS Applications Settings") when the installation is complete.

8.3 DOS Applications Settings

If you install OS/2 Warp 4 onto a system that already has DOS (with or without Windows) installed, OS/2 Warp 4 will migrate your DOS and Windows applications for you (provided of course, that you do not choose to format your hard disk during the installation!). The installation procedure will create icons for your DOS and Windows applications on your OS/2 Warp 4 desktop.

8.3.1 DOS Application Setup

OS/2 Warp 4 does this migration automatically when you choose the **Easy** installation option. If you choose the **Advanced** installation option, you can choose whether or not to migrate your existing applications.

As well as creating icons for your applications, OS/2 Warp 4 also maintains a database containing over 700 common DOS and Windows applications. When you migrate an application, OS/2 Warp 4 checks whether the application exists in this database and if

so, automatically configures the optimum settings for the session in which it will run. See 9.5, "Tuning the Application Environment" on page 764 for more information on these settings.

8.3.2 After Installation

If you install a new DOS application after you have installed OS/2 Warp 4, you have two choices:

- You can manually create a program icon and configure the settings for your application (this is the hard way!)
- You can use the Add Programs utility to automatically create the icon and configure the settings, just as if the application were already there when you installed OS/2 Warp 4 (this is the easy way!)

We recommend that you use the Add Programs utility whenever possible, since this utility makes it very simple to add and configure programs.

8.3.2.1 Using the Add Programs Utility

Click on the **OS/2 System** folder on the desktop, then on the **System Setup** folder, and then select the **Add Programs** utility. This utility is shown in Figure 429.

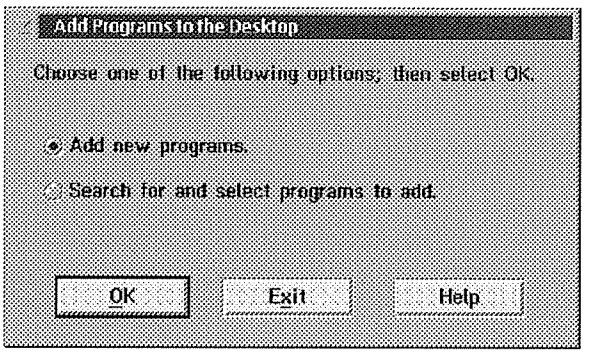

Figure 429. Add Programs Utility

With the Add Programs utility, you have two options:

- If you choose **Add new programs**, OS/2 Warp 4 will search your entire hard disk and any other logical drives (such as CD-ROM drives) that are directly attached to your system, searching for applications. Note, that if you have access to network drives, the utility ignores them. This is the best choice if you are installing many new applications at one time
- If you choose **Search for and select programs to add**, you can choose specific drives to be searched and program types to be added. OS/2 Warp 4 presents you with a list of the applications that it finds, and you may then decide whether to add

them to your desktop. This is the best choice if you want to add a single application, since it requires less time because OS/2 Warp 4 does not search your entire system.

Only programs that are not already on your desktop are added by the Add Programs utility. It ignores any programs that you have already added to your desktop. This is because, whenever you run the utility, or when you choose to add existing programs to your desktop during OS/2 Warp 4 installation, OS/2 Warp 4 creates and maintains a history file named DATABASE.HST, in the \OS2\INSTALL directory on your boot drive. This file contains details of all the programs detected by the Add Programs utility, regardless of whether you decide to add them to your desktop.

When you choose **Search for and select programs to add**, you must specify which drives are to be searched, the types of programs for which the utility should search, and the migration database that the utility should use to configure the applications that it finds. Since you will probably have only one database, leave this field alone, and just choose which drives, and for which programs, you wish to search.

When the search is complete, you will see a list of the programs that the utility has found. You can now decide which of these programs you want to add to your desktop. Only the highlighted ones will be added.

The utility uses the information in DATABASE.HST to determine which applications have already been added to your desktop. While it shows these programs in the list, they are not highlighted and so by default, they will be ignored when the rest are added to your desktop.

8.3.2.2 Manually Configuring Applications

If you choose not to use the Add Programs utility, you can create an icon and configure your application manually. To do this, open the **Templates** folder, select the **Program** template and create a new program icon by dragging the template onto your desktop or the folder in which you want the application to reside. The program icon will automatically open its Properties notebook, as shown in Figure 430 on page 739.

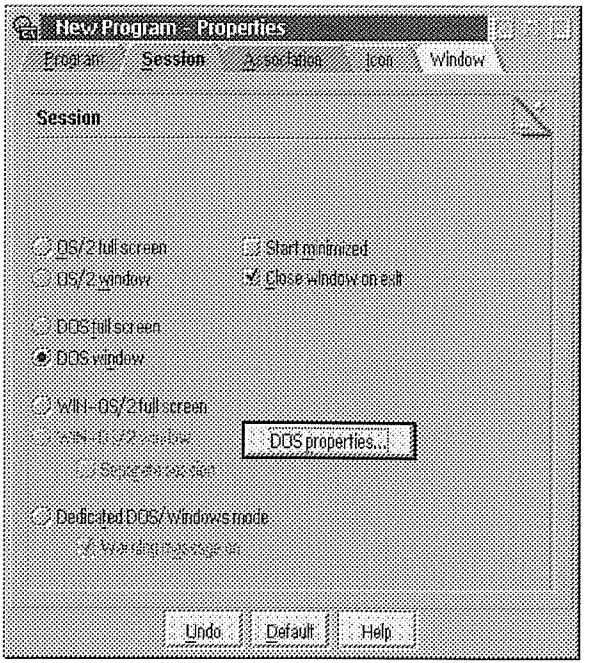

Figure 430. Program Object - Properties Notebook

Fill in the full path and file name of the program, any parameters it requires, and the working directory (this is normally the directory in which the program is installed).

Note

When you type the file name for the program, OS/2 Warp 4 will check the name against its migration database to determine whether it recognizes the program. If so, OS/2 Warp 4 will automatically configure the optimum session settings for the program, and add its name to the Title field on the Icon page of the Properties notebook.

You must then go to the Session page and specify whether you want the program to run in full screen or windowed mode. You can also click on the **DOS settings** button to configure unique session settings for the program (see 8.4, "Tuning the Application Environment" on page 740).

The Association page allows you to associate the program with types of data files, determined either by their file type or by their file name. This association works similarly to that used by Windows. For example, if you associate WordPerfect with all files that

have a name *.DOC, you will then be able to start WordPerfect and load such files simply by double-clicking your mouse on the file's icon.

The Window and Icon pages of the notebook allow you to customize the appearance of the program's window, and to alter the title of the application, which appears beneath its icon and in the title bar of its window while it is running.

When you have finished modifying the notebook, double-click on the icon in the top left-hand corner of the notebook to close it and save your changes. You are now ready to run your program.

8.4 Tuning the Application Environment

OS/2 Warp 4 allows you to individually configure each VDM to meet the requirements of the application that will run in the VDM. In DOS terms, you can think of this as having unique CONFIG.SYS and AUTOEXEC.BAT files for each application, without the need to reboot your system in order to use different configurations.

The configuration settings for a DOS application are stored as part of the program object for that application. To configure a VDM, you need to modify the DOS settings for the program object, using its Properties notebook.

8.4.1 Changing DOS Settings

To change DOS settings, open the Properties notebook for the program object you want to configure, by clicking your right mouse button on the object's icon, and selecting **Properties** from the resulting pop-up menu. Select the **Session** page and click on the **DOS settings** button. OS/2 Warp 4 will then present you with a dialog as shown in Figure 431 on page 741.

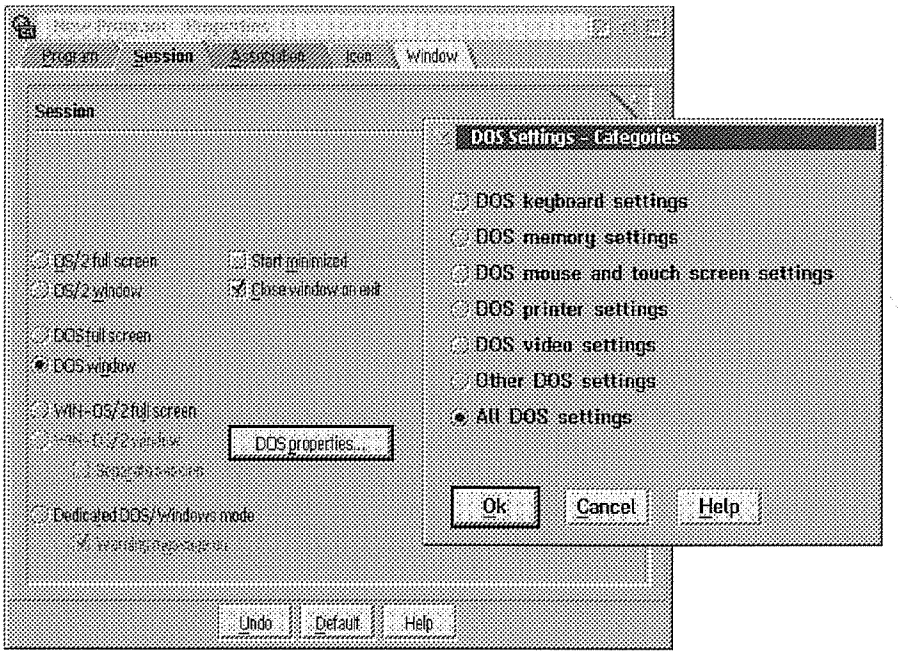

Figure 431. DOS Settings

There are various categories of DOS settings:

- **DOS keyboard settings** allow you to set options such as keyboard type-ahead rates and hot-keys.
- **DOS memory settings** control the limits for expanded, extended and DPMI memory usage within a session.
- **DOS mouse and touch screen settings** control the ownership of the mouse within sessions (certain programs require direct control).
- **DOS printer settings** allow you to control timeouts for your printers, and the separation of output between print jobs.
- **DOS video settings** allow you to set video graphics modes and the behavior of video devices.
- **Other DOS settings** include items for the placement of DOS within the sessions memory, control of hardware items such as timers and communication ports, etc.
- **All DOS settings** presents you with all of the above settings in alphabetical order, rather than separating them into categories.

Note that when configuring a Windows application, an additional category **WIN-OS/2 settings** will appear in the list. See 9.5, "Tuning the Application Environment" on page 764 for more information.

8.4.1.1 Memory Limits

DOS and Windows applications often use special drivers known as memory extenders to overcome the memory limitations of DOS, and access memory above the 640 KB line. Many applications use a standard known as the *DOS Protect Mode Interface* (*DPMI*) but some also use the *Expanded Memory* (*EMS*) or *Extended Memory* (*XMS*) standards. OS/2 Warp 4 supports all three standards for DOS or Windows applications.

OS/2 Warp 4 sets default limits on the amounts of memory available to each application. These are:

- 16 MB of DPMI memory
- 2 MB of EMS memory
- 2 MB of XMS memory

When you add an application or migrate existing applications using the Add Programs utility, OS/2 Warp 4 will set the optimum configurations for any applications that it recognizes. If it cannot recognize your application, it will use the defaults above.

In some cases, these defaults may not be sufficient. For example, you might be accessing a very large spreadsheet file and require more memory to hold the file while you are working on it. You may therefore need to adjust these settings upward in certain cases.

Note

Some applications may cause performance problems if you have these memory limits are set *too* high. This is because these applications attempt to access as much memory as possible, and explicitly wipe out all that memory when loading.

If you load such an application that uses DPMI memory, and you have the memory limit set to 64MB, the application will ask OS/2 Warp 4 how much memory is available, receive an answer of 64MB, and then attempt to write zeroes into every memory location in that 64MB. This will take considerable time, especially since you probably do not have 64 MB of RAM in your system, and OS/2 Warp 4 will therefore have to use virtual memory, which is much slower.

To avoid such situations, you can decrease the memory limit for the application. This will mean that, when the application asks how much memory is available, it will receive a much lower number, and will therefore only initialize that amount of memory.

8.4.1.2 Games Configuration

Most DOS-based games will run in a VDM under OS/2 Warp 4. However, many games have particular resource requirements. When running games under OS/2 Warp 4, you should ensure you specify the following DOS settings:

HW_TIMER	Should be set to ON
IDLE_SENSITIVITY	Should be set to 100
INT_DURING_IO	Should be set to ON for multimedia and CD-ROM games
VIDEO_RETRACE_EMULATION	Should be set to OFF

Larger CD-ROM games may require an adjustment to the EMS or XMS memory settings. Increasing this to 9600 KB should allow most games to function normally.

These settings will ensure the best possible graphics performance for your game programs. Be aware, however, that some programs may require different settings, so you may need to experiment a little. If you use the Add Programs utility to configure your game program (the utility recognizes a number of common games), use the settings configured by the utility in place of those shown above.

8.4.1.3 Loading DOS Device Drivers

You can load regular DOS device drivers into a VDM, as well as the virtual device drivers provided by OS/2 Warp 4. You can do this in a number of ways:

- Add a `DEVICE=` statement to your OS/2 Warp 4 CONFIG.SYS file, which will load the driver into all VDMs you start on your OS/2 Warp 4 system
- Using the DOS settings for a specific VDM, to load the driver only into the VDM for the application that requires it

The first option is useful when you have a driver that is required by all (or most) of your applications. However, if the driver is only required for a specific application, it is not a good idea to load it into every VDM, since this will needlessly use up memory in the VDM's address space.

In such cases, it is better to use DOS settings to load the driver. Another advantage of using DOS settings is that some drivers produce conflicts under DOS, potentially hanging your system. Under OS/2 Warp 4, you can avoid such problems. Since these drivers normally belong to separate applications, you can run them in separate VDMs. They cannot interfere with one another since each VDM has its own protected address space. You can therefore run applications side-by-side under OS/2 Warp 4, where you could not do so under DOS.

Under DOS, you would normally load a DOS driver using a `DEVICE=` statement in your DOS CONFIG.SYS file. Under OS/2 Warp 4, you can load this driver into a VDM using the DOS_DEVICE setting. A list of DOS device drivers currently being loaded into the VDM is displayed on the right of the window. This list may already contain one or more

items, depending on the networking and other options you selected when installing OS/2 Warp 4.

Add the full path and file name of your driver to the list, then click on the **Save** button when you are finished. This will save the DOS settings for the VDM. You can then close the Properties notebook, and you are ready to run your DOS application in the VDM, with the device driver loaded.

8.4.1.4 Using a Customized AUTOEXEC.BAT File

Each VDM in your OS/2 Warp 4 system can have its own AUTOEXEC.BAT file, allowing you to run commands and setup utilities whenever you start the VDM. The default is C:\AUTOEXEC.BAT, but you can specify any file you wish.

The first thing you must do is set up the batch file that you want to run. Remember that you do not need to include the name of the main program that will run in this VDM, since this is already set on the Program page of the Properties notebook. The only things you need to put in the batch file are setup utilities and commands that you need to run before the main program starts.

The following is an example of the base AUTOEXEC.BAT file installed by OS/2 Warp 4 during installation.

```
ECHO OFF
ECHO.
PROMPT $i$p$g
REM SET DELDIR=C:\DELETE,512;
SET WIN3DIR=C:\OS2\MDOS\WINOS2
PATH=C:\OS2;C:\OS2\MDOS;C:\;C:\OS2\MDOS\WINOS2;c:\tcpip\dos\bin;
LOADHIGH APPEND C:\OS2;C:\OS2\SYSTEM
SET TMP=C:\
REM LOADHIGH DOSKEY FINDFILE=DIR /A /S /B $*
REM DOSKEY EDIT=QBASIC/EDITOR $*
REM SET DIRCMD=/A
SET TEMP=C:\OS2\MDOS\WINOS2\TEMP
SET DMQSPATH=C:\XVA$DMQS
C:\XVA$DMQS\XVAVESA.COM
SET ETC=c:\tcpip\dos\etc
```

To change the file name, click on **Other DOS settings** and then click on the **OK** button to display the list of settings.

Select **DOS_AUTOEXEC** from the list. An entry field will appear on the right-hand side of the window. By default, this will contain the file name C:\AUTOEXEC.BAT. Change the file name to match the name of the file you want to use for this VDM, then click on the **Save** button when you are finished. This will save the DOS settings for the VDM. You can then close the Properties notebook, and you are ready to run your DOS application in the VDM, with the new batch file.

8.4.2 Saving Settings in a File

OS/2 Warp 4 allows you to save DOS settings to an encoded file, and then to use this file later to load the settings back into your system or into another system. This feature is particularly useful if you are setting up a number of machines with similar applications (for example, in a corporate network environment).

To save a session's settings in an encoded file, first configure the session to your requirements, then follow the steps below:

1. Click your right mouse button on the program's icon to display the pop-up menu
2. Select **Properties**
3. Select the **Session** page
4. Select the **DOS Settings** button
5. Select any category (it does not matter which one you select)
6. Select **OK**
7. Select the **Print** push button
8. Select **Encoded file**
9. Type the drive, path, and file name in the entry field. The default path is C:\SPOOL\
10. Select **OK** to save the settings to the encoded file

This procedure is illustrated in Figure 432.

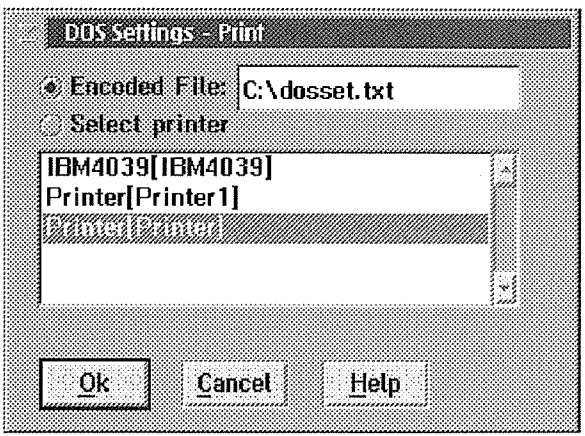

Figure 432. Saving DOS Settings in an Encoded File

Once you have saved the settings in an encoded file, you can restore the settings or transfer them to another machine.

To load the settings from an encoded file, follow these steps:

1. Click your right mouse button on the program's icon to display the pop-up menu
2. Select **Properties**
3. Select the **Session** page
4. Select **DOS settings**
5. Select any category
6. Select **OK**
7. Select the **Load** push button
8. Type the drive, path, and file name of the file you wish to load in the Encoded File field and click on the **Load** button
9. Select **Save**

This procedure is shown in Figure 433.

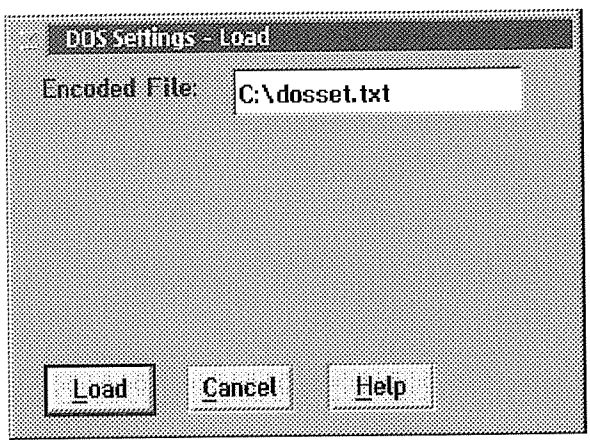

Figure 433. Loading DOS Settings in an Encoded File

The settings loaded from the file will now be used for this VDM.

8.4.3 Dynamically Altering DOS Settings

Some DOS settings affect the way that the VDM is initially set up and how applications are loaded, and these settings can only be altered by closing the VDM session and then making changes. However, you can alter many of the settings for a VDM while the VDM is actually running.

To make such changes, the VDM must be in windowed mode. Click your right mouse button on the icon in the top-left corner of the window, and select the **DOS Settings** item from the resulting pop-up menu.

Note that the list of settings that OS/2 Warp 4 will display at this point does not include all settings. This is because some settings cannot be altered while a VDM is running; OS/2 Warp 4 omits these settings from the list.

8.5 Running a Different Operating System in a VDM

The DOS emulation provided by OS/2 Warp 4 will run most DOS applications without problems. There are some applications, however, that specifically address and even modify DOS internal control data. Since this control data is not present within the VDM's 640 KB address space (because there is no DOS there), these applications will not run under OS/2 Warp 4's DOS emulation. In fact, such applications will not run in many native DOS systems, because they usually require a specific version of DOS.

With OS/2 Warp 4 you can run these applications by running the required version of DOS in a VDM, in place of OS/2 Warp 4's DOS emulation. You can load the DOS version from a DOS boot diskette, or from a compressed diskette image stored on your hard disk.

Note that the specific version of DOS applies only to the VDM in which you choose to load it. Other VDMs running at the same time will continue to use OS/2 Warp 4's DOS emulation. You can even run different DOS versions in different VDMs at the same time.

8.5.1 Booting a DOS VDM from Diskette

The simplest way to boot a specific version of DOS into a VDM is to use a DOS boot diskette. To start a VDM and load DOS from your diskette, follow these steps:

1. Insert your DOS boot diskette into drive A:
2. Open the **OS/2 System** folder on your desktop
3. Open the **Command Prompts** folder
4. Double-click your mouse on the **DOS from Drive A:** icon

OS/2 Warp 4 will now create a VDM and load DOS from your diskette into the VDM. You will see a DOS command line, and you can then issue DOS commands to start programs, run utilities or whatever you wish.

Note that loading from diskette in this way will take longer than starting a regular VDM, since loading the DOS code from diskettes will take longer. You will also find less memory available, since the DOS operating system code must be loaded inside the 640 KB address space, leaving less room for your applications and data.

8.5.2 Booting a DOS VDM from a Diskette Image File

If you will be using a specific version of DOS quite often to run a particular DOS application, you might find that loading DOS from diskette is too slow. You can speed up the loading process by using a diskette image stored on your hard disk. This will allow you to load DOS into the VDM at hard-disk speed, rather than diskette speed.

8.5.2.1 Creating a Diskette Image File

To create your diskette image, you can use the VMDISK utility supplied with OS/2 Warp 4. To use this utility, simply insert your DOS boot diskette in your diskette drive, and issue the VMDISK command from a command line. For example, assuming you wanted to create a diskette image file named DOS33.IMG, in the \IMAGES directory on drive C., you would use the following command:

```
VMDISK A: C:\IMAGES\DOS33.IMG
```

The VMDISK utility will then create the diskette image file and store it in the appropriate directory.

8.5.2.2 Using a Diskette Image File

To specify the location from which OS/2 Warp 4 should load DOS for a particular VDM, click on **Other DOS settings** and then select the **OK** button to display the list of settings.

Select **DOS_STARTUP_DRIVE** from the list. An entry field will appear on the right-hand side of the window. By default, this will be blank, indicating that OS/2 Warp 4 should use its own DOS emulation for this VDM. You can specify A: to direct OS/2 Warp 4 to load DOS from diskette, or the full path and file name of a diskette image file. Change the file name to match the name of the file you want to use for this VDM, then click on the **Save** button when you are finished. This will save the DOS settings for the VDM. You can then close the Properties notebook, and you are ready to run your DOS application in the VDM, with the specific version of DOS loaded from the image file.

8.5.2.3 Diskette Drive Access Problems

When you boot DOS into a VDM from a diskette image file, any requests that you make to drive A: will be directed to that image file, since that is where DOS believes drive A: resides. In order to access your diskette drive to load or save data files, you will need to close the image file, or assign another drive letter to your diskette drive.

You can do this by customizing your boot diskette and image file using the FSACCESS utility. To use the FSACCESS utility, follow these steps:

1. Copy the two files FSACCESS.EXE and FSFILTER.SYS from the \OS2\MDOS directory on your boot drive, onto your DOS boot diskette
2. Edit the CONFIG.SYS file on your boot diskette (that is, A:CONFIG.SYS) and add the following statement:

```
DEVICE=FSFILTER.SYS
```

3. Edit the AUTOEXEC.BAT file on your boot diskette (that is, A:AUTOEXEC.BAT) and add the following statement:

```
FSACCESS B:=A:
```

This will allow you to use the drive letter B: to access your diskette drive. Use the VMDISK utility to build a new diskette image file and store it as normal.

You can now access your diskette drive from applications running within the VDM, using the drive letter B: to access your diskette drive. Note that other VDMs and applications will still be able to use A to access the diskette drive.

8.5.3 HPFS Disk Access

When running OS/2 Warp 4's DOS emulation in a VDM, DOS applications can access your hard disk, regardless of whether it is formatted using the FAT or HPFS file systems. This is because the disk access is actually performed by OS/2 Warp 4, which handles any necessary translation.

When loading DOS from a diskette or image file into a VDM, you are running the "real" DOS operating system, which is not able to do this translation. By default, you therefore cannot access an HPFS drive from such a VDM. OS/2 Warp 4 allows you to overcome this problem, however, using the FSFILTER device driver which intercepts disk access requests and redirects them to OS/2 Warp 4, allowing the required translation to take place. See 8.5.2.3, "Diskette Drive Access Problems" on page 748 for information on how to install the FSFILTER driver on your boot diskette or image file.

8.5.4 Other Operating Systems

Since a VDM under OS/2 Warp 4 simply emulates a computer with an 8086 processor, you can load not only DOS, but any other 8086 operating system into a VDM from a boot diskette or image file. For example, if you have a favorite application that requires the very old CP/M-86 operating system, you can load CP/M-86 into a VDM and run the application.

8.6 Dedicated DOS/Windows Mode

OS/2 Warp 4 introduces a new feature for running DOS, games, or Windows applications, known as *dedicated DOS/Windows mode*. This mode of execution allows you to run almost any DOS or Windows application and game, even those that will not normally run under OS/2 Warp 4, by temporarily suspending OS/2 Warp 4 execution and running the application in a single-tasking, native DOS or Windows environment.

When you run a DOS or Windows program in this environment, OS/2 is not shut down like it is when you use Dual Boot. Instead, OS/2 hibernates to disk and is resumed after you complete the dedicated session activities.

The major advantage of dedicated DOS/Windows mode is that it allows you to run applications that you could not otherwise run on your OS/2 Warp 4 system. Examples

of such applications include those that require direct control over your computer's processor, or Windows applications that use virtual device extenders and need to run at the highest privilege level in the Intel processor. OS/2 Warp 4 does not normally allow you to run these applications, but you can run them using dedicated DOS/Windows mode.

The primary disadvantage of dedicated DOS/Windows mode, however, is that you lose the multitasking capabilities of OS/2 Warp 4, until you exit from the dedicated session. This is because OS/2 Warp 4 suspends its own execution and shuts down all applications other than the one running in the dedicated session. This means that you cannot use the OS/2 Warp 4 LAN client to access network resources, and that other users on a network who may be accessing your files, directories or devices will be locked out until you exit from the dedicated session.

Another factor that must be taken into account is whether you need to access disks formatted using the High Performance File System (HPFS). When running DOS or Windows applications in normal VDMs, OS/2 Warp 4 handles the read and write operations on your application's behalf, and translates file formats automatically. When running in dedicated DOS/Windows mode, however, OS/2 Warp 4 itself is suspended, and you cannot access HPFS drives.

The advantages and disadvantages of dedicated DOS/Windows mode will have a different impact, depending on how you use your OS/2 Warp 4 system. You need to consider these factors and decide whether dedicated DOS/Windows mode is right for you.

You must also setup the environment in Native DOS, and Windows to work with the application or game. You must setup the correct CD ROM and Sound drivers in the native DOS/Windows environment that the application or game needs to run correctly in Dedicated DOS/Windows Mode.

OS/2 Warp 4 has been tested using IBM PC DOS 6.3 and 7.0, and recommends using these version of DOS. However, other versions should operate OK.

8.6.1 Hibernation Setup

The OS/2 hibernation feature is an integral part of dedicated DOS/Windows mode. If you don't need to access the dedicated session you can still take advantage of the hibernation function for a fast suspend/resume operation.

The hibernation function can be made available as an icon on the desktop or a button on the WarpCenter. Users can hibernate OS/2 prior to power off and resume automatically on power up rather than performing shutdown and rebooting.

To invoke the hibernate function, create an OS/2 full-screen program object that points to `\OS2\SYSTEM\\HYBERNAT.EXE`. When this program is launched it will display a message that indicates hibernation was successful and when it is safe to power off your machine.

This removes the need to reboot OS/2 for almost all end users by offering OS/2 hibernation/resume as an alternative to booting the system when powering up. Restoring OS/2 from a hibernated state takes 15 seconds as opposed to minutes when booting the system.

Some device drivers may not be enabled for the suspend/resume operation and will not work correctly when the system is powered on after the hibernate. You may need to reboot your system to recover these devices adapters. Ejecting a PCMCIA adapter before hibernating and then inserting it after the resume will help preserve the correct operation of the adapter.

8.6.2 Checking Whether Dedicated DOS/Windows Mode Is Installed

Dedicated DOS/Windows mode is only installed on your OS/2 Warp 4 system if three conditions are met at OS/2 Warp 4 installation time:

- The boot drive for OS/2 must be IDE, in order for dedicated DOS/Windows mode to function correctly, or your hard disk controller must support the hardware interrupt line of `Int13`.
- Your boot drive must be formatted using the FAT file system
- You must install the Dual Boot feature on your OS/2 Warp 4 system.

To check whether you have dedicated DOS/Windows mode installed, create a program reference object by dragging a template from the Program object in the Templates folder on your Workplace Shell desktop. When the Settings notebook opens, go to the Session page. If dedicated DOS/Windows mode is available on your system, you will see a check box at the bottom of the page, entitled Dedicated DOS/Windows mode.

8.6.3 Configuring an Application for Dedicated DOS/Windows Mode

To run a DOS or Windows application in a dedicated session, simply select the Dedicated DOS/Windows mode check box on the Session page of the Settings window for the application's program reference object. When you start the application by double-clicking your mouse on the object's icon, OS/2 Warp 4 will switch to dedicated DOS/Windows mode to run the application. This option is shown in Figure 434 on page 752.

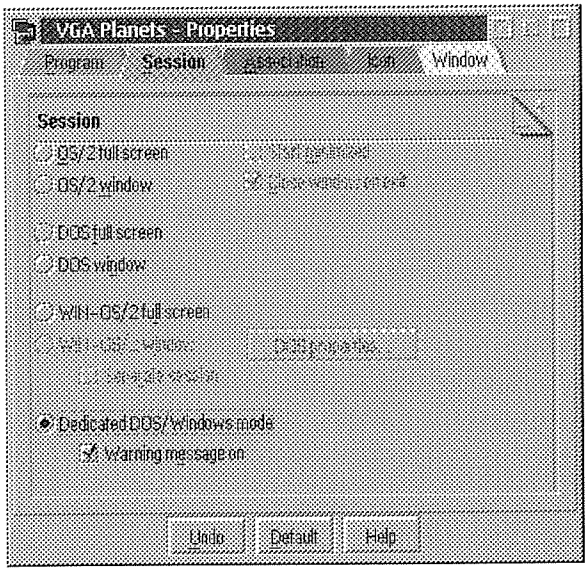

Figure 434. Selecting Dedicated DOS/Windows Mode

When you choose to run an application in dedicated DOS/Windows mode, you are given the option to display a warning message when you start the application. This message reminds you that OS/2 Warp 4 execution will be suspended, and that any other applications running in the system will be shut down until you exit from the dedicated session.

To boot your system to a DOS command prompt using Dedicated DOS/Windows Mode, follow these steps:

1. Open the Programs Folder and drag the icon with you right mouse to the desired location.
2. The New Program Properties notebook will display.
3. In the Path and file name field, enter:

   ```
   C:\DOS\COMMAND.COM
   ```

4. In the Working directory field, enter:

   ```
   C:\DOS
   ```

5. Select the Session Tab, and click on the **Dedicated DOS/Windows mode,** leaving the **Warning message on** also checked.
6. Select the **Icon** tab, and enter a description, for example, PC DOS 7.0.

7. Close the Properties notebook.

Simply double-clicking on the new icon will cause OS/2 to hibernate and load COMMAND.COM and any associated CONFIG.SYS and AUTOEXEC.BAT files.

Note

If you wish to load Windows 3.1 using Dedicated DOS/Windows Mode, for example, C:\WIN31\WIN.COM, the Windows environment parameter must be specified in the AUTOEXEC.BAT file as SET WIN3DIR=C:\WIN31. This is needed, as the hypernation default for Windows 3.1 is C:\WINDOWS. If Windows was installed in the default directory, this is not required.

8.6.3.1 Windows 95 Setup

Although Windows 95 is not directly supported by dedicated DOS/Windows mode, you can set up your system so that it behaves as if it does.

Install OS/2 and Windows 95 in the same partition using Dual Boot. You can make sure everything is working properly first using Dual Boot. Create an OS/2 full-screen program object. Set the path name to a command file such as WIN95.CMD, which contains the following:

```
boot /dos /noboot /quiet
hybernat -r
```

Just click on the object and OS/2 will hibernate itself and boot up Windows 95. When you return from Windows 95, OS/2 will quickly restore the system to where you were when you left it.

On your Windows 95 desktop, create a shortcut to \\OS2\\BOOT.COM /OS2 /QUIET. Use the Advanced Program Settings push button to execute the program in MS-DOS mode.

Turn off the warning message checkbox and select the checkbox to use the current MS-DOS configuration. This will make the return to OS/2 as seamless as possible.

The Just-Add-Warp utility for converting Windows 95 long file names to OS/2 8.3 names with extended attributes is the means for migrating long file names from Windows 95.

Windows 95 can be installed without the long file name support or you can run the utility desired.

8.6.4 Using Dedicated DOS/Windows Mode

After you have configured your DOS or Windows application to run in dedicated DOS/Windows mode, you can start the application simply by double-clicking your mouse on the application's icon. OS/2 Warp 4 will present you with a warning message and if you choose to continue, the following will occur:

1. OS/2 Warp 4 will suspend all other applications currently executing in your system. These applications, and any data files or documents that you are working on, will be saved and then restored when you exit from the dedicated session.
2. OS/2 Warp 4 will suspend its own execution and launch the dedicated session with a native DOS or Windows environment, using the DOS and Windows code present on your hard disk.

You can then use the application normally, running the program and accessing files or documents on any FAT-formatted drive accessible to your system. You can use the application to access devices such as printers or modems attached to your system, provided that your DOS or Windows environment is configured with the required device drivers.

Note

When running in a dedicated session, you must be careful *not* to change any files or documents that were in use by other applications when you started the dedicated session. Since OS/2 Warp 4 is suspended while running the dedicated session, the operating system cannot prevent you from accidentally updating a file that is already in use by another application. When you exit the dedicated session and OS/2 Warp 4 restores your applications and data files, you may lose the changes you made in the dedicated session.

When you exit from the dedicated session, your native DOS or Windows environment is shut down and OS/2 Warp 4 restores itself. Since the Workplace Shell automatically restarts any applications that were active when it was shut down, your system will normally be restored to the same state as when you started your dedicated session. Any files or documents you were working on will appear in the same state as when you started the dedicated session.

Chapter 9. How to Run Windows Applications

Contained within OS/2 Warp 4 is the Microsoft Windows 3.1 interface. This allows you to run Windows 3.1 compatible programs. These programs can be installed, configured, and run in the same way as they would in a DOS/Windows environment, with the added multitasking features of OS/2 Warp 4.

9.1 Operation

The previous chapter describes how OS/2 Warp 4 uses the virtual 8086 mode of the Intel processor to run multiple DOS applications. Since Microsoft Windows is actually an application that runs under DOS, similar techniques allow Windows applications to run under OS/2 Warp 4 as well.

Windows applications running under OS/2 Warp 4 enjoy the same benefits as DOS applications; they may have full memory protection, use preemptive multitasking to optimize performance, and each application may have its own uniquely configured environment.

Note that Windows applications *may* have full memory protection. You have the choice of whether to run Windows applications with or without this protection. See 9.2.2.2, "Using Separate Sessions" on page 758 for more details on this subject.

9.2 Installing WIN-OS/2

You will normally install WIN-OS/2 when you install OS/2 Warp 4. If you choose the **Easy** installation option, you will automatically install WIN-OS/2 support. If you choose the **Advanced** installation option, you can choose whether you want to install WIN-OS/2 support or not. See Chapter 2, "Planning and Installing OS/2 Warp 4" on page 15 for further information on installing OS/2 Warp 4 options.

9.2.1 Adding WIN-OS/2 Support after Installation

If you have already installed OS/2 Warp 4 and did not install WIN-OS/2 at that time, but you now want to run Windows applications, you can install WIN-OS/2 using the OS/2 Warp 4 Selective Install utility.

To start the Selective Install utility, insert your OS/2 Warp 4 CD-ROM in your CD-ROM drive, and follow these steps:

1. Open the **OS/2 System** folder on your desktop
2. Open the **System Setup** folder

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3. Double-click your mouse on the **Selective Install** icon to start the Selective Install utility

The first window deals with your hardware configuration. On the second window, you will see a list of installation options including WIN-OS/2. Note that this is the same screen that you saw when you first installed OS/2 Warp 4.

Click your mouse on the check box to the left of the WIN-OS/2 list item, then select the **Install** button.

> **Note**
>
> If you have installed Windows 95, you must click on the **More** button, then select **Advanced Configuration**, and choose **Install standard WIN-OS/2 Desktop**, as the Windows 95 desktop is not compatible with the Windows 3.1 desktop.

When the installation has completed, you will need to reboot your system before you can use WIN-OS/2, since the installation makes some changes to your OS/2 Warp 4 configuration files. Simply follow the instructions given to you by the Selective Install utility.

Note that when you use the Selective Install utility, OS/2 Warp 4 will ask you whether you wish to add existing DOS and Windows programs to your OS/2 Warp 4 desktop. Selecting this option will automatically invoke the Add Programs utility (see 9.4, " Windows Applications Configuration" on page 761) when the WIN-OS/2 installation is complete.

If you have Windows 95 applications installed, do not add these to your OS/2 Warp 4 desktop.

9.2.2 WIN-OS/2 Configuration

Windows applications can be started in the same way as any other application under OS/2 Warp 4, simply by double-clicking your mouse on an application's icon. However, WIN-OS/2 provides some configuration options that you may wish to use, as described in the following sections.

To set or change any of the WIN-OS/2 options, click on the **WIN-OS/2 Setup** utility, as shown in Figure 435 on page 757:

1. Open the **OS/2 System** folder on your desktop
2. Open the **System Setup** folder

3. Double-click your mouse on the **WIN-OS/2 Setup** icon to start the WIN-OS/2 setup utility

The WIN-OS/2 configuration options can be modified as required.

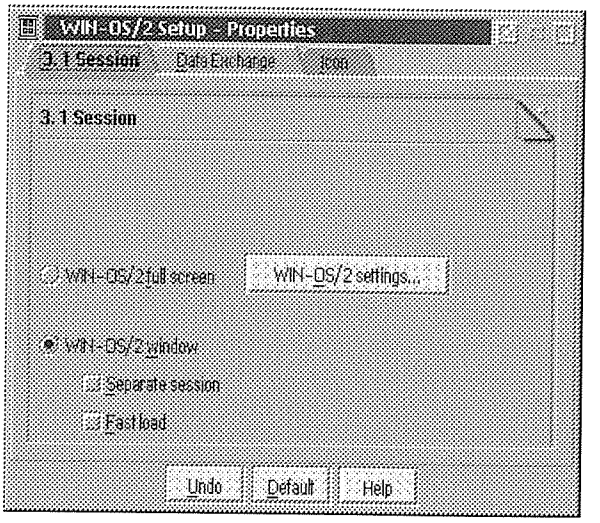

Figure 435. WIN-OS/2 Setup Utility - Page 1

9.2.2.1 Windowed or Full Screen

WIN-OS/2 allows you to run a Windows application in either of two ways:

- **Full screen** mode creates a full-screen session containing your WIN-OS/2 Program Manager desktop configuration. Within this session, you can start and control Windows applications just as though you were running under DOS and Windows. OS/2 Warp 4 will continue to run in the background, and all your other OS/2 Warp 4 applications will still continue. To get to the OS/2 Warp 4 desktop, either press Ctrl+Esc or double-click your mouse on the **Desktop** icon in the lower-left corner of your Windows desktop.
- **Windowed** mode allows Windows applications to run on your OS/2 Warp 4 desktop, alongside your OS/2 Warp 4 applications. With windowed mode, you can move and size your windows so that you can view other Windows, DOS, or OS/2 applications on your screen at the same time.

If you wish, you can choose a different execution mode for each Windows application you install in your system; that is, you may run one application in full screen mode, while running others in windowed mode. The choice is yours.

The WIN-OS/2 Setup utility lets you specify which execution mode you want to be the default mode. When you install WIN-OS/2, the default is set to windowed mode. If you wish to change this, simply click your mouse on the **Full screen** radio button in the WIN-OS/2 Setup utility notebook.

9.2.2.2 Using Separate Sessions

When you run a Windows application in full screen mode, OS/2 Warp 4 creates a separate session for each application. Each application therefore has its own set of resources such as memory, file handles, etc., and each application is fully protected from other applications running in your system.

When you run multiple Windows applications in windowed mode or full screen mode, OS/2 Warp 4 normally runs all these applications in one session. This reduces the total memory requirement, but it also means that while the applications are protected from DOS and OS/2 applications, they are *not* protected from one another. That is, a bug in one Windows application could affect other Windows applications running in the same session.

If you wish, you can have OS/2 Warp 4 run all your Windows applications in separate sessions, so that each application is protected from all the others. To this, simply click on the **Separate session** check box in the WIN-OS/2 Setup utility. This will instruct OS/2 Warp 4 to use separate sessions for windowed mode as well as full screen mode.

For performance reasons, we recommend running your windowed mode applications in a common session if possible. If you have one or more Windows applications that you suspect contain bugs, you can instruct OS/2 Warp 4 to run just those applications in separate sessions, leaving the remainder of your applications running in a common session. To do this, follow these steps:

1. Click your right mouse button on the application's icon, and select the **Properties** menu item to open the application's Properties notebook
2. Go to the Session page by selecting the tab with your mouse
3. Click on the **Separate session** check box
4. Close the Properties notebook

OS/2 Warp 4 will now start this application in a separate session, while still allowing other Windows applications to run in a common session.

Note that some Windows applications may require that you run them in a common session. This happens when an application consists of a set of related Windows programs, which may share data in memory using a non-standard sharing technique. Since Windows allows an application to access any area of memory without

regulation, such programs will work quite happily under Windows. However, OS/2 Warp 4 does not allow one program to access another program's memory except in certain well-defined ways. If you try to run these applications in separate sessions under OS/2 Warp 4, OS/2 Warp 4 will not allow the memory sharing to take place. However, such applications will work if you run them in a common session.

9.2.2.3 Fast Load

The OS/2 Warp 4 Fast Load feature enables you to start Windows applications more quickly under OS/2 Warp 4, since OS/2 Warp 4 automatically loads much of the WIN-OS/2 code into memory when you boot your system, rather than waiting until you start your first Windows application.

To turn on Fast Load, select the **Fast load** check box in the WIN-OS/2 Setup utility. From now on, whenever you boot OS/2 Warp 4, WIN-OS/2 support will automatically be loaded into memory.

You should remember that, with Fast Load turned on, it will now take longer to boot OS/2 Warp 4. However, you will recoup some of that time since your Windows applications will load faster.

Note that Fast Load works *only* for Windows applications running in windowed mode, using a common session. If you start Windows applications in full screen mode, or if you tell OS/2 Warp 4 to use a separate session for a particular application, that application cannot take advantage of Fast Load.

9.2.2.4 WIN-OS/2 Settings

You can individually configure the environment for each Windows application installed in your system, just as you can for DOS applications. However, the WIN-OS/2 Setup utility allows you to specify a default configuration for all Windows applications in your system. This means that any new Windows applications you install under OS/2 Warp 4 will have this configuration.

To change the default configuration for Windows applications, click on the **WIN-OS/2 settings** button in the WIN-OS/2 Setup utility. You will then be presented with a list of DOS and WIN-OS/2 settings that you can change.

9.2.2.5 DDE and Clipboard

The WIN-OS/2 Setup utility includes a second page, entitled Data Exchange. This page allows you to set or change the defaults for data exchange options, such as Dynamic Data Exchange (DDE) or the clipboard, between Windows applications and OS/2 applications. This is shown in Figure 438 on page 765.

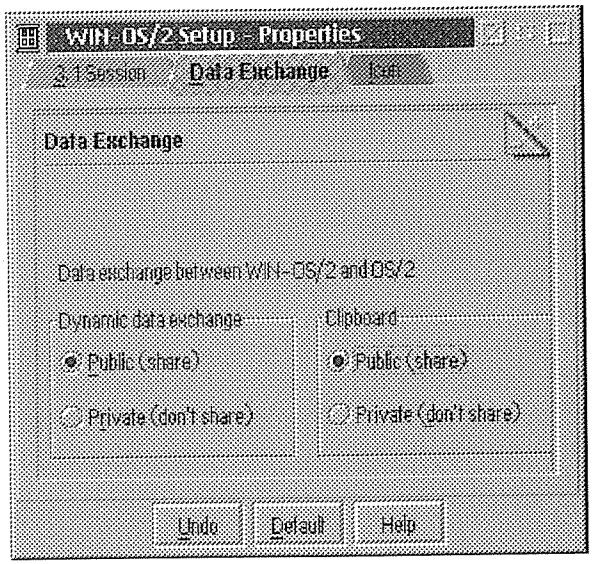

Figure 436. WIN-OS/2 Setup Utility - Page 2

By default, you can perform DDE between a Windows application and an OS/2 application, since OS/2 Warp 4 automatically handles any necessary movement of data and conversion between data formats. However, you may decide to limit DDE to within a WIN-OS/2 session only and not allow sharing. You can do this by clicking on the **Private** radio button in the Dynamic data exchange group.

OS/2 Warp 4 also normally allows you to cut and paste information, using the clipboard, between Windows applications and OS/2 applications. Should you wish to separate the two and not permit such sharing, you can do this by clicking on the **Private** radio button in the Clipboard group.

9.3 Supported Windows Versions

OS/2 Warp 4 allows you to run applications that were written for different versions of Microsoft Windows. WIN-OS/2 is designed to support applications written for Windows 3.0 or 3.1, or Windows for Workgroups.

However, it will also support many applications written for earlier versions of Windows.

Note

OS/2 Warp 4 will not allow you to run applications written for Windows 95. These applications are incompatible with WIN-OS/2.

Note that using OS/2 Warp 4's Dedicated DOS/Windows mode may allow you to run applications that cannot otherwise be run under OS/2 Warp 4. See 8.6, "Dedicated DOS/Windows Mode" on page 749 for more information on Dedicated DOS/Windows mode.

9.3.1 Win32 and Win32s

Many applications written for Windows 3.1 or Windows for Workgroups 3.1 use a programming interface known as *Win32s*. You can run such applications under OS/2 Warp 4, since WIN-OS/2 supports the Win32s interface.

Any application that is written to use Win32s V1.25a or less will run under OS/2 Warp 4. An application that requires a higher version of the Win32s interface may or may not run under OS/2 Warp 4, depending on the exact nature of the services it requests.

9.4 Windows Applications Configuration

If you install OS/2 Warp 4 onto a system that already has DOS and Windows installed, OS/2 Warp 4 will migrate your DOS and Windows applications for you (provided of course, that you do not choose to format your hard disk during the installation!). The installation procedure will create icons for your DOS and Windows applications, as well as your Windows program groups, on your OS/2 Warp 4 desktop.

9.4.1 Migration

OS/2 Warp 4 does this migration automatically when you choose the **Easy** installation option. If you choose the **Advanced** installation option, you can choose whether or not to migrate your existing applications.

As well as creating icons for your applications, OS/2 Warp 4 also maintains a database containing over 500 common DOS and Windows applications. When you migrate an application, OS/2 Warp 4 checks whether the application exists in this database and if so, automatically configures the optimum settings for the session in which it will run. See 9.5, "Tuning the Application Environment" on page 764 for more information on these settings.

9.4.2 Post Installation

If you install a new Windows application after you have installed OS/2 Warp 4, you have two choices:

- You can manually create a program icon and configure the settings for your application (this is the hard way!)
- You can use the Add Programs utility to automatically create the icon and configure the settings, just as if the application was already there when you installed OS/2 Warp 4 (this is the easy way!)

We recommend that you use the Add Programs utility whenever possible, since this utility makes it very simple to add and configure programs.

9.4.2.1 Using the Add Programs Utility

Select the **Add Programs** utility from the System Setup folder, which resides within the OS/2 System folder on your desktop. This utility is shown in Figure 437.

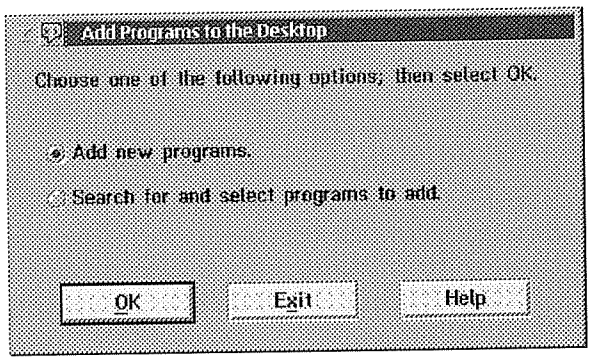

Figure 437. Add Programs Utility

With the Add Programs utility, you have two options:

- If you choose **Add new programs**, OS/2 Warp 4 will search your entire hard disk and any other logical drives (such as CD-ROM drives) that are directly attached to your system, searching for applications. Note that if you have access to network drives, the utility ignores them. This is the best choice if you are installing many new applications at one time.
- If you choose **Search for and select programs to add**, you can choose specific drives to be searched and program types to be added. OS/2 Warp 4 presents you with a list of the applications that it finds, and you may then decide whether to add them to your desktop. This is the best choice if you want to add a single

application, since it requires less time because OS/2 Warp 4 does not search your entire system.

Only new programs are added by the Add Programs utility. It ignores any programs that you have already added to your desktop. This is because, whenever you run the utility, or when you choose to add existing programs to your desktop during OS/2 Warp 4 installation, OS/2 Warp 4 creates and maintains a history file named DATABASE.HST, in the \OS2\INSTALL directory on your boot drive. This file contains details of all the programs detected by the Add Programs utility, regardless of whether you decide to add them to your desktop.

When you choose **Search for and select programs to add**, you must specify which drives are to be searched, the types of programs for which the utility should search, and the migration database that the utility should use to configure the applications that it finds. Since you will probably have only one database, leave this field alone, and just choose which drives, and for which programs, you wish to search.

When the search is complete, you will see a list of the programs that the utility has found. You can now decide which of these programs you want to add to your desktop. Only the highlighted ones will be added.

The utility uses the information in DATABASE.HST to determine which applications have already been added to your desktop. While it shows these programs in the list, they are not highlighted and so by default, they will be ignored when the rest are added to your desktop.

9.4.2.2 Manually Configuring Applications

If you choose not to use the Add Programs utility, you can create an icon and configure your application manually. To do this, open the **Templates** folder, find the Program template and create a new program icon by dragging the template onto your desktop or the folder in which you want the application to reside.

The program icon will automatically open its Properties notebook. Fill in the full path and file name of the program, any parameters it requires, and the working directory (this is normally the directory in which the program is installed).

Note

When you type the file name for the program, OS/2 Warp 4 will check the name against its migration database to determine whether it recognizes the program. If so, OS/2 Warp 4 will automatically configure the optimum session settings for the program, and add its name to the Title field in the Icon page of the Properties notebook.

You must then go to the Session page and specify whether you want the program to run in full screen or windowed mode, and whether you want a separate session for a windowed mode program. You can also click on the **WIN-OS/2 settings** button to configure unique session settings for the program (see 9.5, "Tuning the Application Environment").

The Association page allows you to associate the program with types of data files, determined either by their file type or by their filename. This association works similarly to that used by Windows. For example, if you associate Microsoft Word for Windows with all files that have a name *.DOC, you will then be able to start Word for Windows and load such files simply by double-clicking your mouse on the file's icon.

The Window and Icon pages of the notebook allow you to customize the appearance of the program's window, and to alter the title of the application, which appears beneath its icon and in the title bar of its window while it is running.

When you have finished modifying the notebook, double-click on the icon in the top left-hand corner of the notebook to close it and save your changes. You are now ready to run your program.

9.5 Tuning the Application Environment

OS/2 Warp 4 allows you to individually configure the execution environment of each DOS and Windows application. Whenever you start an application, OS/2 Warp 4 creates a session with the configuration options you specify, and runs the application in that session.

You specify these configuration settings using DOS and WIN-OS/2 settings. There are a large number of these settings; see Appendix E, "DOS and WIN-OS/2 Settings" on page 1019 for a full listing. Note that many of the DOS settings apply to Windows applications as well.

9.5.1 Changing DOS and WIN-OS/2 Settings

To change DOS and WIN-OS/2 settings, go into a program icon's Properties notebook, switch to the Session page and select the **WIN-OS/2 settings** button. OS/2 Warp 4 will then present you with a dialog as shown in Figure 438.

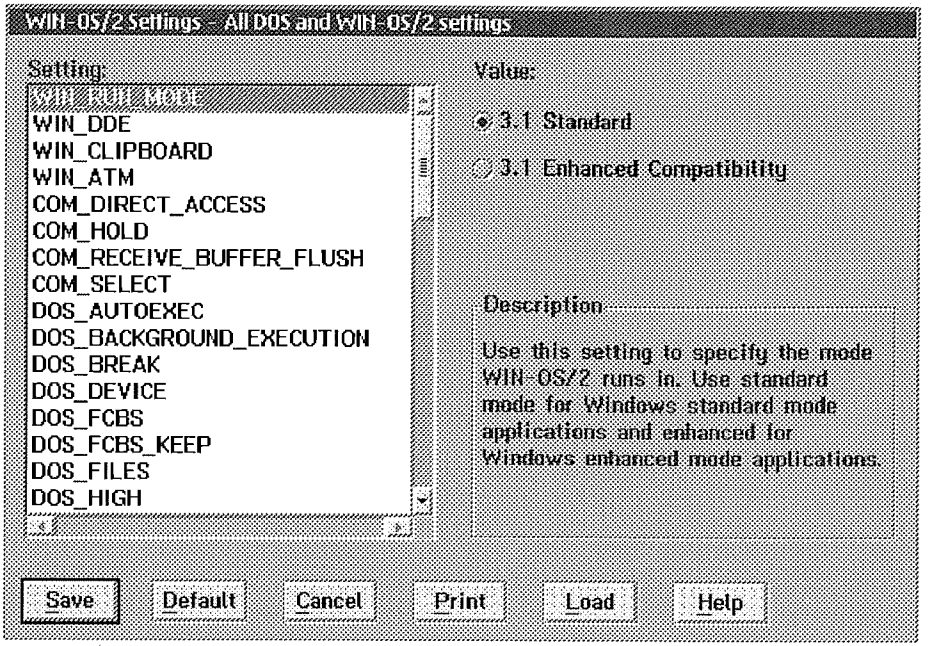

Figure 438. DOS and WIN-OS/2 Settings

There are various categories of DOS and WIN-OS/2 settings:

- **DOS keyboard settings** allow you to set options such as keyboard type-ahead rates and hot-keys.
- **DOS memory settings** control the limits for expanded, extended and DPMI memory usage within a session.
- **DOS mouse and touch screen settings** control the ownership of the mouse within sessions (certain programs require direct control).
- **DOS printer settings** allow you to control timeouts for your printers, and the separation of output between print jobs.
- **DOS video settings** allow you to set video graphics modes and the behavior of video devices.

- **Other DOS settings** include items for the placement of DOS within the sessions memory, control of hardware items such as timers and communications ports, etc.
- **WIN-OS/2 settings** allow you to specify the run mode (standard or enhanced), the behavior of DDE and the clipboard within a session, and to enable or disable support for Adobe Type Manager (ATM) fonts.
- **All DOS and WIN-OS/2 settings** presents you with all of the above settings in alphabetical order, rather than separating them into categories.

9.5.1.1 Standard and Enhanced Mode

Windows applications normally run in one of two modes; standard mode or 386 enhanced mode. In most cases, an application requires a particular mode in order to run. OS/2 Warp 4 allows you to run either of these types of applications since WIN-OS/2 supports both standard and enhanced modes. You can even run different sessions with different modes at the same time.

By default, WIN-OS/2 uses standard mode. Occasionally, you may start a Windows application under OS/2 Warp 4 and see an error message such as `This application requires 386 Enhanced Mode`. If you encounter such a message, you can set the application to run in 386 enhanced mode by accessing the WIN-OS/2 settings and changing the WIN_RUN_MODE setting to 386 Enhanced Compatibility.

9.5.1.2 Memory Limits

Windows applications use special drivers known as memory extenders to overcome the memory limitations of DOS, and access memory above the 640 KB line. The Windows operating environment handles the memory allocation requests on behalf of the application, and then in turn OS/2 Warp 4 allocates the requested memory.

As with DOS applications, Windows applications are controlled by the same memory defaults set at installation by OS/2 Warp 4. These are:

- 16 MB of DPMI memory
- 2 MB of EMS memory
- 2 MB of XMS memory

When you add an application or migrate existing applications using the Add Programs utility, OS/2 Warp 4 will set the optimum configurations for any applications that it recognizes. If it cannot recognize your application, it will use the defaults above.

In some cases, these defaults may not be sufficient. For example, you might be accessing a very large spreadsheet file and require more memory to hold the file while you are working on it. You may therefore need to adjust these settings upward in certain cases.

Warning

Some applications may cause performance problems if you have these memory limits set *too* high. This is because these applications attempt to access as much memory as possible, and explicitly wipe all that memory when loading.

9.5.2 Saving Settings in a File

OS/2 Warp 4 allows you to save DOS and WIN-OS/2 settings to an encoded file, and then to use this file later to load the settings back into your system or into another system. This feature is particularly useful if you are setting up a number of machines with similar applications (for example, in a corporate network environment).

To save a session's settings in an encoded file, first configure the session to your requirements, then follow the steps below:

1. Click your right mouse button on the program's icon to display the pop-up menu
2. Select **Properties**
3. Select the **Session** page
4. Select the **WIN-OS/2 settings** button
5. Select any category (it does not matter which one you select)
6. Select **OK**
7. Select the **Print** push button
8. Select **Encoded file**
9. Type the drive, path, and file name in the entry field (the default path is C:\SPOOL\)
10. Select **OK** to save the settings to the encoded file

This procedure is illustrated in Figure 439 on page 768.

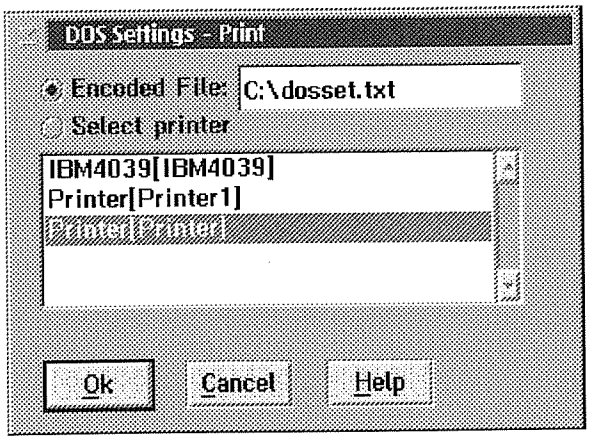

Figure 439. Save DOS/Windows Settings in an Encoded File

Once you have saved the settings in an encoded file, you can restore the settings or transfer them to another machine.

To load the settings from an encoded file, follow these steps:

1. Click your right mouse button on the program's icon to display the pop-up menu
2. Select **Properties**
3. Select the **Session** page
4. Select **WIN-OS/2 settings**
5. Select any category
6. Select **OK**
7. Select the **Load** push button
8. Type the drive, path, and file name of the file you wish to load, in the Encoded File field and click on the **Load** button
9. Select **Save**

The settings loaded from the file will now be used for this WIN-OS/2 session.

9.6 Windows Sound Card Support

OS/2 Warp 4 allows you to run Windows applications that use sound cards. In some cases, however, you may find that even though your regular OS/2 applications produce sound, you cannot get sound from your Windows applications.

The exact steps that you now need to follow, depending upon the type of sound card installed in your computer, are shown in 2.6.2, "Installing and Configuring Audio Cards" on page 58.

9.7 The WIN-OS/2 Session

Once a WIN-OS/2 session has been started, you will see the Program Manager window with the WIN-OS/2 Main group displayed. All features available with a DOS/Windows machine are available with a couple of exceptions.

9.7.1 WIN-OS/2 Groups

There are three WIN-OS/2 groups; these are:

- WIN-OS/2 Main
- WIN-OS/2 Accessories
- Startup

There is no Games group, as games are included within OS/2 Warp 4 Workplace Shell. Other applications can be installed and groups are displayed as normal. This is shown in Figure 440 on page 770.

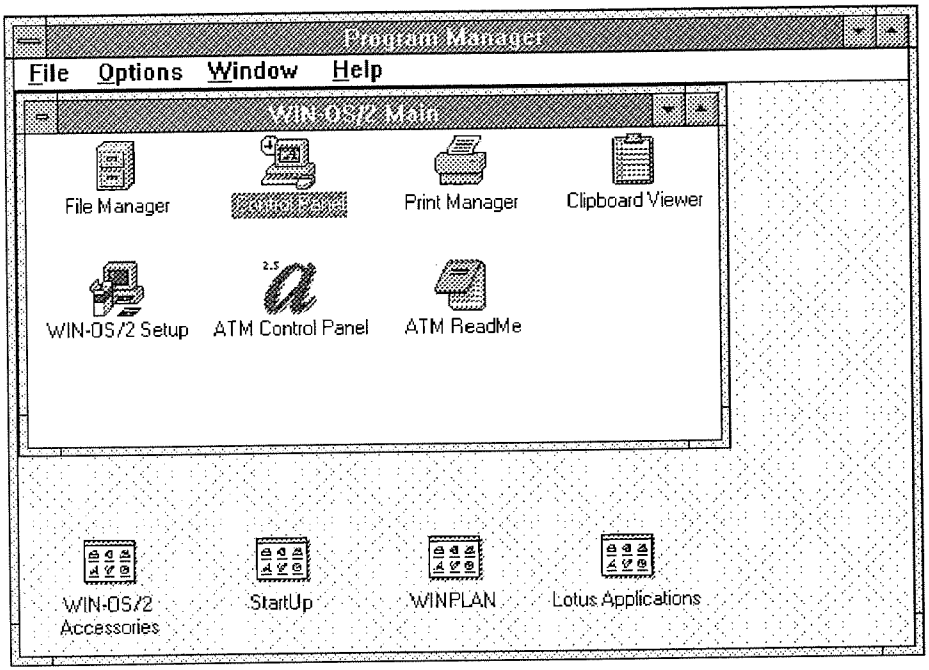

Figure 440. WIN-OS/2 Windowed Session

9.7.1.1 WIN-OS/2 Main Group

All the standard programs are included. The change occurs within the WIN-OS/2 Setup program, where only the type of network can be set. The other configuration options of Display, Mouse, and Keyboard are all controlled by the Selective Install utility found in the System Folder of OS/2 Warp 4.

Figure 440 displays a WIN-OS/2 environment with IBM OS/2 LAN Server installed. This setting must be added using the Options menu of WIN-OS/2 setup.

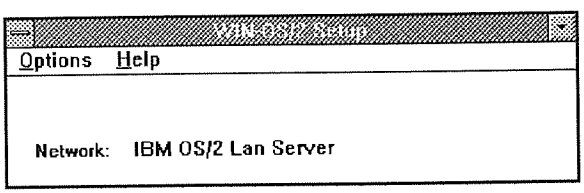

Figure 441. WIN-OS/2 Setup Window

9.7.1.2 WIN-OS/2 Control Panel

The WIN-OS/2 environment is controlled by each of the programs contained within the Control Panel. They have the following functions:

- Color - Similar to the schemes object with OS/2 Warp 4, the color function controls the different colors scheme available, and also allows for the customization of border, highlight, active window, etc., colors.
- Fonts - Listed the installed fonts with WIN-OS/2. Truetype fonts can be enabled, and also additional fonts installed.
- Ports - Provides the ability to set baud rate, data bits, parity, stop bits, and flow control for each COM port installed. The IRQ and memory address of the port can be also specified.
- Mouse - Controls the tracking speed, and double click speed for the mouse. Mouse trails are not available within a WIN-OS/2 session.
- Desktop - Allows for screen saver settings, wallpaper background, icon spacing and cursor blink rate.
- Keyboard - Controls the repeat rate.
- Printers - Allows for WIN-OS/2 printers to be added, configured and connected to the appropriate port or network queue.
- International - Specifies the country, language, and the default country setting. Also the measurement type, date and time format, currency format and also the number format.
- Date/Time - Allows for changing the data and/or time.
- ODBC - ODBC drivers can be added if an application requires this for connection. Some database servers use these drivers, for example, DB/2.
- Drivers - Drivers specific to the WIN-OS/2 environment are added here. These maybe sound drivers, or additional MIDI or CD audio drivers.
- Sound - Controls what sounds are set for a certain Windows event. These are all grey if there is no sound driver/card installed.

There is no 386 Enhanced icon within the Control Panel, even though 386 Mode has been selected. This is because all the functions of virtual memory, COM port conflicts, etc., are handled directly by OS/2 Warp 4.

9.7.2 WIN-OS/2 System Files

The WIN-OS/2 system files are stored in `[Bootdrive]\OS2\MDOS\WINOS2.`

This is the main directory, with the SYSTEM directory located beneath the WINOS2 directory.

The primary system files SYSTEM.INI and WIN.INI are listed in Appendix E, "DOS and WIN-OS/2 Settings" on page 1019.

Chapter 10. Recovery

OS/2 Warp is an extremely stable operating environment. It has earned a place in many large corporations functioning as a mission-critical operating platform for accounting applications, mail servers, and file servers.

However, there are times when disk corruption may be caused by power failure, an application may somehow crash the system, or you receive a Trap error message due to a hardware device failure, and system recovery tools are required.

OS/2 Warp 4 provides many built-in functions that enable you to recover data and program files, and also to rebuild the complete system back to before it crashed.

10.1 System Startup

System startup is often when most problems are encountered by the user. OS/2 Warp 4 provides a number of *hot-key* combinations that you can use during system boot to tell you what is happening and allow you to restore your system to an operating state.

10.1.1 Hot-Key Combinations

Whenever you boot OS/2 Warp 4, you will see a small white bar in the upper left-hand corner of your panel, as shown in Figure 442. This bar appears just before the OS/2 Warp 4 logo is displayed.

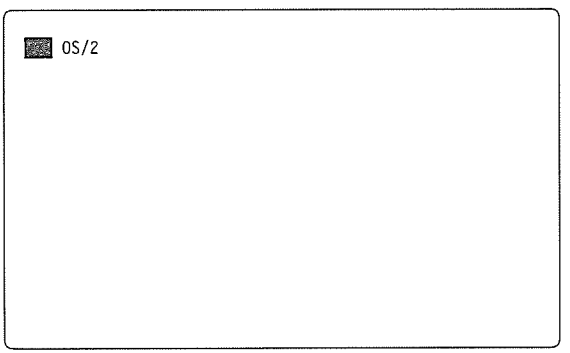

Figure 442. Small White Bar at Startup (shown Here in Black)

While this white bar is visible, you can select any of the following hot-key sequences, which will interrupt or affect the startup sequence for OS/2 Warp:

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- **Alt+F1** will interrupt OS/2 Warp 4 startup and take you to the Recovery Choices panel.
- **Alt+F2** will continue OS/2 Warp 4 startup, but will display the name of each device driver as it loads.

These hot-key combinations are also available during system installation and can be useful with installation problems.

There is also a third hot-key sequence you can use during startup, although it differs from the other two since you do not use it when the white bar is displayed. Ctrl+Shift+F1 will continue OS/2 Warp 4 startup, but will tell the Workplace Shell not to automatically start any programs or open any Workplace Shell objects.

10.1.1.1 Alt+F1 - System Recovery Panel

If you press Alt+F1 when the small white bar is displayed on the panel, OS/2 Warp 4 will halt its startup sequence and take you to the Recovery Choices panel. This panel is shown in Figure 443.

```
                        RECOVERY CHOICES

Select the system configuration file to be used, or enter the option
corresponding to the archive desired.

ESC - Continue the process using \CONFIG.SYS without changes
F2  - Go to the Command line, (no files replaced, use original CONFIG.SYS)
F3  - Reset primary video display to VGA and reboot
F4  - Restart the system from the Maintenance Desktop (Selective Install)
F5  - Enable full hardware detection
F6  - Disable full hardware detection

Choosing an archive from the list below replaces you current CONFIG.SYS,
Desktop directory, and INI files with older versions.  These older
versions might be different from your current files.  Your current files
are saved in \OS2\ARCHIVES\CURRENT.

   1) Archive created 9-23-96  9:59:32AM
   2) Archive created 9-24-96  9:55:16AM
   3) Archive created 9-29-96  1:30:07AM
   0) Original archive from INSTALL created 9-15-96 4:39:48PM
```

Figure 443. OS/2 Warp 4 Recovery Choices

This panel provides you with a number of options for recovery, and is discussed in more detail in 10.2.2, "System Recovery Options" on page 778.

10.1.1.2 Alt+F2 - Device Driver Names during Startup

If your system displays a trap message (see 11.3.2, "Traps" on page 824) or *hangs* during startup, the Alt+F2 hot-key combination enables you to check which device driver is being loaded when the problem occurs. If there is a faulty device driver, the system will stop loading the devices and will display the name and/or line in the CONFIG.SYS file where the faulty device driver occurs. Your system will halt at this point.

Note

If you select the **Display Recovery Choices at each restart** option from the Archive option in your Workplace Shell desktop, Alt+F2 does *not* display the device driver names during startup. See 10.2.1, "Archive Feature" on page 776 for further information.

You may even find that, when you activate the Alt+F2 hot-key combination, the error no longer occurs. In some cases, an error may be due to intermittent timing and/or load problems on your network, causing a LAN device driver to initialize itself incorrectly. Using Alt+F2 slows down the boot process slightly, and may therefore avoid such timing problems.

10.1.1.3 Disabling AutoStart

The Workplace Shell includes a feature that, when you shut down your system, takes note of all folders that are open and applications that are running. When you restart your system, the Workplace Shell automatically reopens these folders and restarts the programs.

While this is often very useful, you might not want to start every program and open every folder. You can suppress this feature as follows:

- To suppress it permanently, add the following statement to your CONFIG.SYS file:

  ```
  SET RESTARTOBJECTS=STARTUPFOLDERSONLY
  ```

  This statement tells the Workplace Shell not to restart any program or reopen any folder unless that folder is within the Startup folder. The RESTARTOBJECTS options are documented in the *OS/2 Warp 4 Desktop Guide*.

  Note that, by not opening folders and programs that were running at shutdown, your OS/2 Warp 4 system will boot more quickly.

- You can remove the PROGRAMS keyword from the SET AUTOSTART= statement in your CONFIG.SYS file for an effect similar to the above. The *OS/2 Warp 4 Desktop Guide* contains a detailed explanation of the parameters for the SET AUTOSTART statement.
- To suppress auto-start for the current boot *only*, press Ctrl+Shift+F1 when the single-color desktop background (without any icons) first appears, and hold these keys down until your desktop icons appear on the panel.

  This hot-key combination is slightly different from the others, since you do not use it when the small white bar is displayed at the beginning of OS/2 Warp 4 startup. Instead, you must wait until all device drivers are loaded and the panel changes to a single color without any icons (just before your desktop background appears).

  Note that you must use the *left* shift key, not the right shift key when performing this hot-key sequence.

10.2 The Desktop Archive Feature

OS/2 Warp 4 includes a feature that allows you to create an automatic backup of your system configuration files, including your Workplace Shell desktop, every time you reboot your system. This feature is known as the *desktop archive* feature, and the backup copies it creates are known as *archives*. If something happens and you lose your configuration files for any reason, you can use these archives to restore your configuration and get your system up and running again.

10.2.1 Archive Feature

OS/2 Warp 4 always creates one archive, at the time you install OS/2 Warp 4 on your system. This means that even if you do not normally use the desktop archive feature, you can at least return to the configuration you had when you first installed OS/2 Warp 4.

However, you will probably have added applications, folders and icons to your desktop, and possibly modified other system settings after you installed OS/2 Warp 4, so the original archive may not be what you want. To have OS/2 Warp 4 make a new archive each time you reboot, you must turn on the desktop archive feature.

To turn on the desktop archive feature, open the Workplace Shell desktop's **Properties** notebook by clicking your right mouse button on a blank area of the desktop, and selecting **Properties** from the pop-up menu. Click on the **Archive** tab. The Archive folder is shown in Figure 444 on page 777.

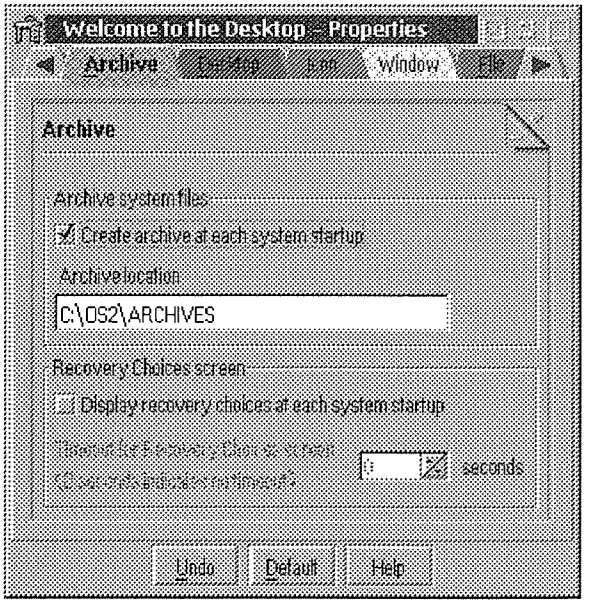

Figure 444. Desktop Archive Settings

To turn on the desktop archive feature, simply click on the check box entitled **Create archive at each system startup**. This will tell OS/2 Warp 4 to create a new set of archive files each time you reboot.

OS/2 Warp 4 creates up to three sets of archives. When you reboot for the fourth and subsequent times, OS/2 Warp 4 deletes the oldest set of archives so that the three most recent archives will remain in your system.

The Archive page also allows you to set some other options for the desktop archive feature. The default location for archives is the \OS2\ARCHIVES directory on your boot drive, but you can alter this location if you wish. The archives can be placed on any logical drive to which OS/2 Warp 4 has access at boot time.

Once you have created your archives, you need a way to access them. You do this using the Recovery Choices panel, which is described in 10.2.2, "System Recovery Options" on page 778.

The final option on the Archive page affects how you access this panel. The default way to do this is to use the Alt+F1 hot-key sequence at startup time, to interrupt OS/2 Warp 4 startup and display the Recovery Choices panel. However, you also can

instruct OS/2 Warp 4 to display this panel *every* time you reboot your system, so that you do not need to press Alt+F1.

To do this, select the **Display Recovery Choices at each restart** check box on the Archive page of the desktop Properties notebook. You can also specify a timeout value; if you have not made a selection from the menu after the specified number of seconds, OS/2 Warp 4 will automatically continue startup.

To disable the timeout setting, simply set the value to 0 and OS/2 Warp 4 will wait for a selection indefinitely.

10.2.2 System Recovery Options

The System Recovery panel choice maybe displayed during or after installation. Figure 445 displays the options available if problems are experienced during installation. This is shown by pressing Alt+F1 when booting from the OS/2 Warp 4 installation diskettes.

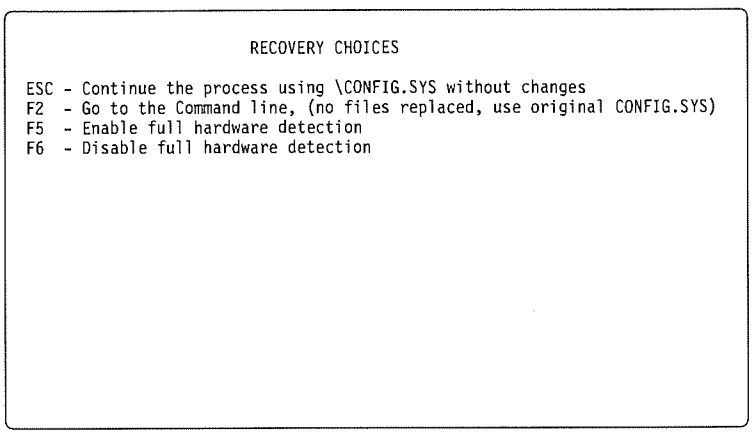

Figure 445. OS/2 Warp 4 Recovery Choices

Figure 446 on page 779 shows the Recovery Choices panel that is displayed if you press Alt+F1 during a normal OS/2 Warp 4 startup. This panel has a number of standard options at the top, and up to three generations of your desktop archives at the bottom (post installation only). Note that the menu item for each archive displays the date and time at which the archive was created.

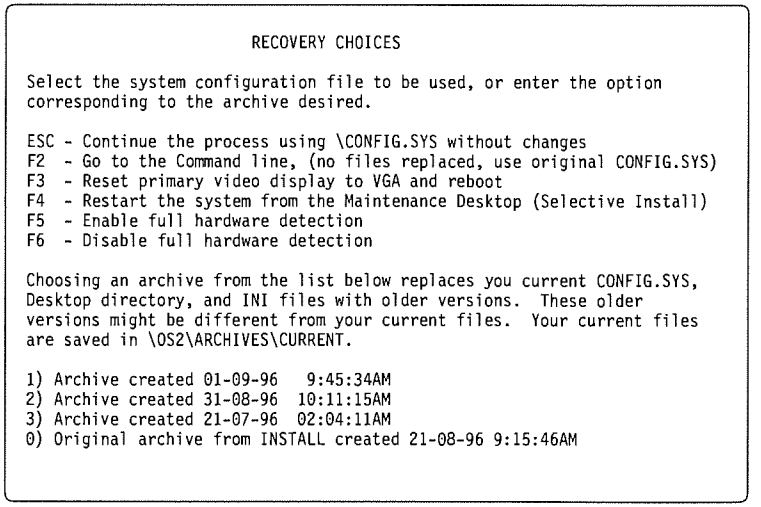

Figure 446. OS/2 Warp 4 Recovery Choices

When you first install OS/2 Warp 4, or when you first turn on the desktop archive feature, you will not see all four archive generations, since these only appear progressively as you reboot and OS/2 Warp 4 creates the archives. After your first reboot, you will see the original archive created after installation; the other archives will appear progressively after each reboot.

Note that you can use the Recovery Choices panel to create and boot your own customized system configurations, as well as the archives created for you by OS/2 Warp 4. See 10.3, "Customizing Your Archives" on page 781 for information on how to create such configurations and add them to the Recovery Choices panel.

10.2.2.1 Booting to a Command Line - F2

Option F2 on the Recovery Choices panel allows you to go to a command line. When you select this option, OS/2 Warp 4 starts up using the original CONFIG.SYS file that existed when you first installed, but does not start the Workplace Shell. Instead, it takes you immediately to a full-screen command line session.

This option is useful if your Workplace Shell configuration files have been corrupted and you have no archives from which you can restore them. You can go to a command line and run the MAKEINI.EXE program to rebuild your OS/2 Warp 4 desktop configuration.

You can also fix disk errors by running the CHKDSK command.

Note that you cannot use the command line option from the Recovery Choices screen to fix disk errors on your boot drive. This is because OS/2 Warp 4 is still using this drive, and you therefore cannot run the CHKDSK command with the /F option. To run CHKDSK and fix such errors, you must boot from diskettes or from a maintenance partition.

You can also use this option to edit your CONFIG.SYS file (or indeed many other files). Since the Workplace Shell is not started, you cannot use the OS/2 System Editor or the Enhanced Editor, but OS/2 Warp 4 includes a small full-screen editor named TEDIT.EXE for just this situation.

Once your modifications are complete, you can reboot your system using Ctrl+Alt+Del, or return to the Recovery Choices menu by typing `EXIT` at the command line and pressing the Enter key.

10.2.2.2 Resetting the Video Display to VGA - F3

Option F3 on the Recovery Choices panel resets your video display mode to VGA. This option allows you to recover from a situation where you may install a new video driver and accidentally provide incorrect settings for it in OS/2 Warp 4. You can fall back to a standard VGA mode, which is supported by almost all video adapters and drivers, then reinstall the driver and provide the correct configuration settings.

Note that when you use this option, OS/2 Warp 4 will remove any video drivers you have installed and replace them with a default 16-color VGA video driver. You will need to reinstall any other drivers, exactly as if you were installing them for the first time.

To reinstall your drivers, start the Selective Install utility from the System Setup folder within the OS/2 System folder on your desktop. When OS/2 Warp 4 displays the first dialog, select the **Primary Display** option and follow the instructions.

10.2.2.3 Booting to a Maintenance Desktop - F4

Option F4 on the Recovery Choices panel takes you to a Maintenance Desktop. This is the same desktop that you see during OS/2 Warp 4 installation, when you set your hardware configuration and choose installation options.

From the Maintenance Desktop, you can do several things:

- You can use the Selective Install utility to replace a damaged part of your OS/2 Warp 4 system (for example, you may have accidentally deleted some of your OS/2 Warp 4 system files or the directories in which they reside).

- You can reinstall OS/2 Warp 4, starting from the point at which you specify the installation options. This will not replace the operating system itself, but will replace the Workplace Shell.

If the Workplace Shell does not start when you boot OS/2 Warp 4, you should first try issuing MAKEINI or CHKDSK commands to rebuild your OS/2 Warp 4 desktop and fix any disk errors. Only if these measures do not work should you reinstall OS/2 Warp 4.

10.2.2.4 Enable Full Hardware Detection- F5

Option F5 on the Recovery Choices panel will allow automatic hardware detection of plug-and-play-compliant adapter cards in your system. This is the default.

10.2.2.5 Disable Hardware Detection- F6

Option F6 on the Recovery Choices panel will not allow hardware detection of plug-and-play compliant cards in you system. This option is useful if you have a problem with a plug-and-play adapter during installation.

10.2.2.6 Restoring Archived Configurations

There may be up to four archive options at the bottom of the Recovery Choices menu, depending on whether you are using the desktop archive feature. You can boot using any of these archives, by pressing the key corresponding to the letter or number to the left of the archive menu item.

When you select an archive to restore, OS/2 Warp 4 retrieves the system configuration files from that archive and copies them to their correct locations on your hard disk, overwriting the current versions of those files. OS/2 Warp 4 then continues its startup sequence.

Note that there may be less than four archives in this section of the Recovery Choices panel. If you do not use the desktop archive feature, there will probably be only one entry; the original archive created when you installed OS/2 Warp 4. If you have recently turned on the desktop archive feature, there may be less than three entries, since new entries are only created each time you reboot.

Note that archive 0 will *always* contain the configuration files from your initial installation of OS/2 Warp 4. The desktop archive feature *does not* update this archive.

10.3 Customizing Your Archives

As well as simply saving your OS/2 Warp 4 configuration files, you can use the desktop archive feature in a number of other ways:

- You can specify additional files that are critical to your system, which the desktop archive will then save along with the default OS/2 Warp 4 configuration files.
- You can use the desktop archive feature to maintain your own customized system configurations (for example, with or without LAN support loaded), allowing you to boot OS/2 Warp 4 using your choice of system configuration.

10.3.1 Including Additional Files

By default, the desktop archive feature saves the following key files when it creates an archive:

- OS2.INI
- OS2SYS.INI
- CONFIG.SYS
- STARTUP.CMD
- AUTOEXEC.BAT
- OS2INIT.CMD

The archive feature also saves a complete copy of your desktop configuration (that is, your folders and so on) in a directory tree within the archive directory.

A file named OS2.KEY contains the names of the files that are to be saved by the desktop archive feature. This file resides in the \OS2\ARCHIVES directory (though its location will change if you altered the default location for archives on the Archive page of the desktop Properties notebook), and the default file is shown in Figure 447.

```
OS/2       Ctrl+Esc = Window List        Type HELP = help

[C:\]cd \os2\archives

[C:\os2\archives]type os2.key
KEYFILE:OS2.INI
KEYFILE:OS2SYS.INI
KEYFILE:C:\CONFIG.SYS
KEYFILE:C:\STARTUP.CMD
KEYFILE:C:\AUTOEXEC.BAT
KEYFILE:C:\OS2INIT.CMD

[C:\os2\archives]_
```

Figure 447. OS2.KEY File

You can add new files to be archived by simply creating a ?.KEY file (where ? is any file name you like) and specifying the names of the additional files to be archived. This new file is governed by two rules:

1. The file must reside in the directory \OS2\ARCHIVES of your boot disk
2. The file you create must be in the same format as the OS2.KEY file; that is,

   `KEYFILE:d:\path\filename.ext`

   Where:

   - `KEYFILE` is an explicit keyword
   - `d:` is the drive containing the file you would like to archive.
   - `\path\` is the fully qualified path to the file to be archived.
   - `filename.ext` is the name of the file to be archived.

The desktop archive feature will then save these files along with the default OS/2 Warp 4 configuration files. For example, you might want to add your network protocol definition file PROTOCOL.INI to be archived. This file normally resides in the \IBMCOM directory on your boot drive. For example, you might create a file named PROT.KEY with the following line added:

```
KEYFILE:C:\IBMCOM\PROTOCOL.INI
```

The next time the archive feature creates an archive, this file will be included. Note that adding a file to the archive will *not* include that file in any archives that have already been created.

The files that you add to your ?.KEY key may reside on any local drive, and in any directory. However, you must specify the full drive and path name to the file if the file does not reside in the root directory of your boot drive.

You can restore an entire archive, or select a single file to be extracted from the archive. See 10.3.2.3, "Default Location for Archives" on page 786 for a cross-reference listing of system file names to archive file names.

10.3.2 Creating Your Own Configurations

OS/2 Warp 4 provides a facility that enables the use of several different boot configurations. This feature becomes very useful on notebook computers where the machine is used in an office environment, at home or at a customer site.

You could use a single OS/2 Warp 4 configuration that includes drivers and support for all these items, but you would then receive startup errors in certain situations. For example, LAN support would give you an error when used at home, since it would try to connect you to a LAN that does not exist.

While these errors will not prevent OS/2 Warp 4 from starting correctly, the extra device drivers and programs cause OS/2 Warp 4 to start up more slowly, and take up extra memory that you could otherwise use for applications and data files. It can therefore be useful to tailor different configurations for different uses of your system.

You can do this using the desktop archive feature, creating your own customized configurations, storing them as archives, and displaying them using the Recovery Choices panel at startup time. The archive feature works in the following way:

- Whenever you press a key on the Recovery Choices panel, and that key is not one of the standard menu options, the archive feature checks whether a CONFIG.*?* and/or ALTF1*?*.CMD file exists in the \OS2\BOOT directory (where *?* is the key that you pressed).
- If these files exist, the CONFIG.? file is used instead of the CONFIG.SYS file located in the root directory of your boot drive.

10.3.2.1 Creating a Configuration

The most important file that you will need to save when creating an archive is CONFIG.SYS. In many cases, this is the only file that will differ from the standard configuration, particularly if you are modifying device drivers and no more.

Once you have a copy of your CONFIG.SYS file, with the correct contents that you want for your archive, you need to place this file in the \OS2\BOOT directory, and name it CONFIG.*?*, where *?* is the letter that you will use to select this archive from the Recovery Choices panel. You may use any letter except X, x, C, c, M, m, V or v (since these are reserved letters).

We will use an example to illustrate how this works. Assuming that you wish to create an archive that includes no LAN support, you would make a copy of your CONFIG.SYS file, and remove all the statements that cause LAN drivers to be loaded.

The following is an example of what could be added to the Recovery Choices panel:

```
S) Boot Standalone with no LAN drivers
```

The new CONFIG.SYS file would then be placed in the \OS2\BOOT directory with the name CONFIG.S.

You can also create a file named ALTF1*?*.CMD, which will be run after OS/2 Warp 4 boots using your archive. For example, you might want to have a particular command file run during system startup. Continuing our example, we call this file ALTF1S.CMD. Use a text editor to create the file containing the appropriate commands.

Note that you can create such a command file, regardless of whether you create a new version of CONFIG.SYS for your archive. For example, you might want to start OS/2 Warp 4 using a standard CONFIG.SYS, but occasionally run the command file to perform some additional system setup. You can therefore create only CONFIG.?, only ALTF1?.CMD, or both.

10.3.2.2 Modifying the Recovery Choices Panel

When you have created your new configuration, you need to add it to the Recovery Choices panel. The text for the Recovery Choices panel is defined by three files, all of which reside in the \OS2\BOOT directory:

- **ALTF1TOP.SCR** displays the introductory text, including the initial *standard options* menu and the following explanatory notes, but not the menu where your archive options are displayed.

  You can modify this file if you wish. For example, if you are a system administrator for a corporate LAN, you may wish to add a note warning users not to reset their displays to VGA mode.

- **ALTF1MID.SCR** displays the archives created by the system using the desktop archive feature.

  There is little point in modifying this file, since it is automatically updated by the desktop archive feature whenever you reboot.

- **ALTF1BOT.SCR** can be used to add your own customized archives.

  This file is never modified by OS/2 Warp 4, and you should therefore use this file when adding your own customized archives to the Recovery Choices panel.

Note that these three files are all read-only files. Before you can modify them, you must use the ATTRIB command to change their attributes and allow you to edit them.

To add the previous example to the Recovery Choices panel, follow these steps:

1. Go to a command line prompt, and change directories to \OS2\BOOT
2. Since the ALTF1BOT.SCR file is read-only, the attributes must be changed by entering `ATTRIB -r ALTF1BOT.SCR`
3. Edit ALTF1BOT.SCR with an editor such as E.EXE or EPM.EXE and add the following line:

   ```
   S) Boot Standalone with no LAN drivers
   ```

You should indent the text by three characters, and keep a blank line at the top of the file, to be consistent with the existing format. You should do one last thing to make it easier to use your customized configuration. Open the desktop **Properties** notebook,

and go to the Archive page. Select the **Display Recovery Choices at each restart** check box, and set the Timeout for the Recovery Choices panel option to a value of 10 seconds. This will mean that you do not need to press Alt+F1 to display the Recovery Choices panel, and the Recovery Choices panel will stay up for 10 seconds, before automatically continuing system startup with the last selected configuration.

Your customized Recovery Choices panel might look like the one shown in Figure 448.

```
                        RECOVERY CHOICES

Select the system configuration file to be used, or enter the option
corresponding to the archive desired.

ESC - Continue the boot process using \CONFIG.SYS without changes
F2  - Go to command line, (no files replaced, use original CONFIG.SYS)
F3  - Reset primary video display to VGA and reboot
F4  - Restart the system from the Maintenance Desktop (Selective Install)
F5  - Enable full hardware detection
F6  - Disable hardware detection

Choosing an archive from the list below replaces your current CONFIG.SYS,
Desktop directory, and INI files with older versions. These older versions
might be different from your current files. Your current files are saved in
\OS2\ARCHIVES\CURRENT.

1) Archive created 9-23-96  9:59:32AM
2) Archive created 9-24-96  9:55:16AM
3) Archive created 9-29-96  1:30:07AM
0) Original archive from INSTALL created 9-15-96 4:39:48PM

S) Boot Standalone with no LAN drivers
```

Figure 448. Customized Recovery Choices Panel

10.3.2.3 Default Location for Archives

This section describes the location of all files and subdirectories used when creating and restoring archives using the desktop archive feature. By default, the majority of these files and subdirectories reside within the \OS2\ARCHIVES directory on your boot drive. Note that this location will change if you specify a different location for archives in the Archive page of the desktop Properties notebook.

The exceptions to this rule are certain files that are required at the very beginning of system startup, such as CONFIG.SYS and the contents of the Recovery Choices panel. These files must reside in the \OS2\BOOT directory, since OS/2 Warp 4 has not yet established full access to the hard disk at the time these files are needed.

Table 7 (Page 1 of 2). Default Location for Archives		
Directory	**File Name**	**Description**
\OS2\		
	ARCRECOV.EXE	Program used to restore an archive at system boot time.
	ARCINST.EXE	Program used to install all archive/restore files and to create the original archive.
\OS2\BOOT\		
	ALTF1TOP.SCR	Top of Recovery Choices panel.
	ALTF1MID.SCR	Middle of Recovery Choices panel.
	ALTF1BOT.SCR	Bottom of Recovery Choices panel.
	CONFIG.X	CONFIG.SYS file for the archive created during OS/2 Warp 4 installation.
	ALTF1.CMD	Command file called when the user presses a valid key (that is, chooses to restore an archive) from the Recovery Choices panel.
	CONFIG.?	CONFIG.SYS file for a particular archive or customized configuration.
	ALTF1?.CMD	ALTF1?.CMD file for a particular customized configuration.
	ARCHBASE.$$$	Holds minimum archive information.
\OS2\ARCHIVES\		
	OS2.KEY	Default OS/2 list of KEY files. Only resides in this directory.
	ARCHIVES.$$$	List of archives of this subdirectory (\01, \02, ..., \0X). This is a binary file and should not be altered.
\OS2\ARCHIVES\CURRENT\		Directory to hold all current files replaced by an archive.
\OS2\ARCHIVES\01\		Directory containing all files and subdirectories for the existing archive.
	KEYS.$$$	File that contains all key file information. This is a binary file and should not be altered.
	DESKTOP	Archive of the entire desktop tree.
	0(*)	Archive (not compressed) of the first file archived.
	1(*)	Archive (not compressed) of the second file archived.
	2(*)	Archive (not compressed) of the third file archived.

Table 7 (Page 2 of 2). Default Location for Archives

Directory	File Name	Description
	3(*)	Archive (not compressed) of the fourth file archived.
	4(*)	Archive (not compressed) of the fifth file archived.
	n(*)	Archive (not compressed) of the *nth* file archived.
\OS2\ARCHIVES\02\		Directory containing all files and subdirectories for one of your existing archive in the same format as described in the 01 archive.
\OS2\ARCHIVES\03\		Directory containing all files and subdirectories for one of your existing archive in the same format as described in the 01 archive.
\OS2\ARCHIVES\0X\		Directory containing the archive created during OS/2 Warp 4 installation in the same format as described in the 01 archive.

Note:

* indicates

- The files in the \OS2\ARCHIVES\?? directory are sequentially numbered 0,1,2,3,,,,n and equate to the files listed in all your *.KEY files provided they exist.
- The *.KEY files are processed in the same order that they appear if you do a DIR command in the \OS2\ARCHIVES directory

The files can be extracted individually but each installation will vary depending on the file system chosen and the existence of files (if a file listed in any *.KEY file does not exist is it skipped).

10.3.2.4 Resetting the Installation Archive

After some time, the archive created when the system was first installed may become irrelevant, and you may want to update it to create a new base archive. You can do this by running the ARCINST command from a command line.

10.4 Booting from Utility Diskettes

Utility diskettes are a set of diskettes that allow you to boot your OS/2 Warp 4 system from diskette, and get to a command line session. They provide a last-resort safety net in the remote chance that something goes seriously wrong and you cannot use any of the options on the Recovery Choices panel.

10.4.1 Building Utility Diskettes

In the System Setup folder on your desktop, you will find the Create Utility Diskettes utility. This utility lets you build a set of four utility diskettes that you can use to boot OS/2 Warp 4 and get to a command prompt.

Simply double-clicking on the Icon and inserting disks when required will create these disks.

10.4.2 Using Utility Diskettes

To use your utility diskettes, simply place the first diskette in your diskette drive and start your system. Follow the instructions to add other diskettes when required, until you arrive at a command line session.

From this session, you can do the following:

- Run the CHKDSK command with the /F or /F:3 options to search for and correct errors on your hard disk. This will often allow you to reboot your OS/2 Warp 4 system and continue working with no loss of data.
- Back up or restore any OS/2 Warp 4 system files and directories, including files that are normally locked during OS/2 Warp 4 execution.
- Use a text based editor to edit your CONFIG.SYS file. OS/2 comes with a utility called TEDIT.EXE.

When you have completed the operation you wish to do with the utility diskettes, you can simply reboot your system using Ctrl+Alt+Del.

10.5 System Recovery Utilities

In the event of a System crash, OS/2 Warp 4 includes different utilities to recover you system and data files, and hopefully allow your system to boot again.

10.5.1 CHKDSK

The CHKDSK.COM command line utility is used to analyze directories and files, determine the file system type, and produce a disk status report. CHKDSK also displays the volume label and the volume serial number of the disk.

The syntax for CHKDSK can be viewed, either by typing:

```
HELP CHKDSK
```

or

```
CHKDSK /?
```

You will notice there are different switches for the two supported file systems.

Figure 449 shows the syntax listing from CHKDSK /?.

```
OS/2      Ctrl+Esc = Window List       Type HELP = help


[C:\]chkdsk /?

Use the CHKDSK command to analyze directories and files,
determine the file system type, and produce a disk status report.
syntax for the FAT file system:
  CHKDSK [drive:][path].[filename]
[/F][/V]
syntax for the HPFS file system:
  CHKDSK [drive] [/C][/F:n]
where:
  drive           Specifies the drive on which the check is performed.
  path\filename   Specifies the location of the file you want to check.
  /F              Fixes the errors on the disk.
  /V              Displays all files and their paths on the drive.
  /C              Specifies that files are recovered only if the file
                  system is in an inconsistent state.
  /F:n      Fixes the errors on the disk.  The default error level
                  is 2.
                    /F: - Analyzes and displays information, but does
                          not perform repairs.
                    /F:1 - Resolves inconsistent file system structures.
                    /F:2 - Resolves inconsistent file system structures
                          and scans the entire file system disk space.
                    /F:3 - Resolves inconsistent file system structures,
                          scans the entire file system disk space, and
                          scans the entire disk partition.

To check the current disk, type: CHKDSK

[C:\]_
```

Figure 449. CHKDSK Command

10.5.1.1 CHKDSK Parameters

To analyze a file named REPORTS.ABC, enter:

```
CHKDSK REPORTS.ABC
```

To use global file-name characters to display the status of all files that begin with "REPORT" and contain other characters, enter:

```
CHKDSK REPORT*.*
```

To fix errors that are found in the file allocation table (FAT) or directory, enter:

```
CHKDSK /F
```

To display all files and directories on the current drive, enter:

```
CHKDSK /V
```

To specify files that will be recovered if the file system was in an inconsistent state when the computer was started, enter:

```
CHKDSK /C
```

To specify a recovery level, (If no number is specified, CHKDSK assumes recovery level 2) enter:

```
CHKDSK /F
```

To specify that CHKDSK is to analyze the file system, display information about its state, but not perform any repairs, enter:

```
CHKDSK /F:
```

To specify that CHKDSK is to resolve inconsistent file system structures, enter:

```
CHKDSK /F:1
```

To specify that CHKDSK is to resolve inconsistent file system structures, scan disk space that is in use but not referred to by the file system, and recover recognizable file or directory structures that are found, enter:

```
CHKDSK /F:2
```

To specify all level 2 recovery and also specify CHKDSK is to scan the entire disk partition for recognizable file system structures enter:

```
CHKDSK /F:3
```

Note: The /C and /F:n parameters are only operable with the High Performance File System.

10.5.1.2 CHKDSK Considerations

When using CHKDSK on a disk formatted for the High Performance File System (HPFS), it is important to note how CHKDSK processes lost clusters and how they are recovered.

CHKDSK does not delete lost clusters. If lost clusters are found and the /F parameter is specified, CHKDSK recovers lost clusters and does not prompt you if you want to convert lost chains to files. Instead, CHKDSK creates a subdirectory of the root

directory named \FOUND.mmm and places recovered files, directories, and extended attributes there. The mmm in the directory name represents a three-digit number so that each directory name is unique. CHKDSK stores recovered files as files with the naming format: FILEnnnn.CHK. It stores recovered directories as directories that follow this naming format: DIRnnnn.CHK.

When using CHKDSK on a disk formatted for the High Performance File System, you cannot specify a file by using the filename parameter.

10.5.2 PMCHKDSK Command

The PMCHKDSK command provides a graphical interface to the CHKDSK utility.

When you run PMCHKDSK, a pop-up menu will appear containing the selection boxes for Check, Cancel, and Help; it will also have a Write corrections to disk check box. The default is that this box is not selected; unless this box is selected, the CHKDSK operation does not alter the contents of the disk. This is equivalent to running CHKDSK without the /F flag.

To start PMCHKDSK, type `PMCHKDSK`.

Once the disk has been analyzed, a graphical display shows the type of file system, bytes used, and bytes available on the disk.

This shown in Figure 450 on page 793.

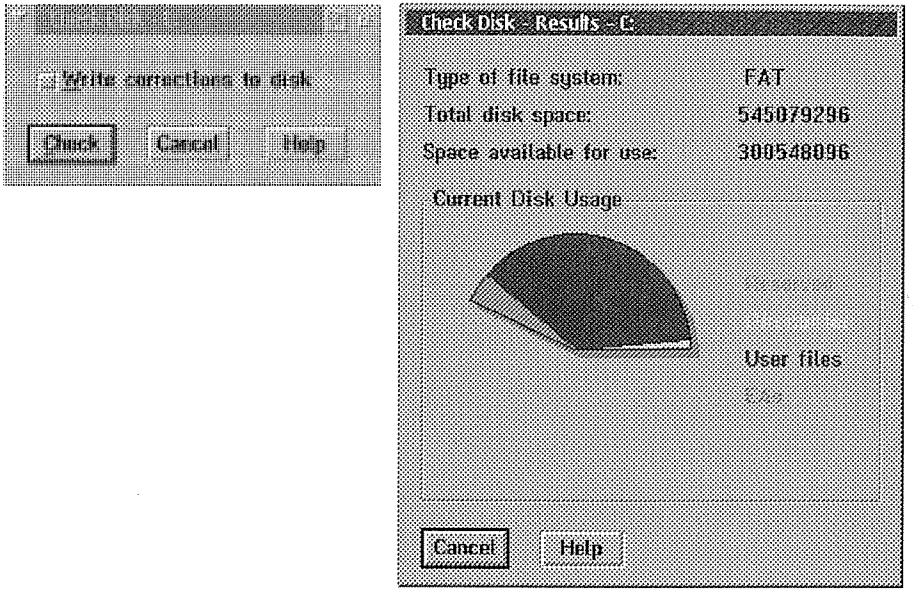

Figure 450. PMCHKDSK Disk Analysis

Note: PMCHKDSK does not work on drives that have an ASSIGN, JOIN, or SUBST command in effect. Also, PMCHKDSK does not work on network drives.

10.5.3 RECOVER Command

This command recovers files from a disk that contains defective sectors.

OS/2 reads the specified disk, sector by sector. If RECOVER finds a bad portion, the sector is marked and data is no longer allocated to it. All the files on the disk can be recovered if the directory has been damaged.

RECOVER cannot recover files on the disk that contains the RECOVER.EXE file or the disk used to start the OS/2 operating system. RECOVER locks the drive to be recovered so that no other applications or processes are allowed to access the drive.

The OS/2 message file, C:\OS2\SYSTEM\OSO001.MSG, must not be on the disk to be recovered. To be sure it is not, do the following:

1. Copy the following files to a blank, formatted diskette:

   ```
   C:\OS2\RECOVER.COM
   C:\OS2\SYSTEM\OSO001.MSG
   ```

2. Delete these files from the disk to be recovered.
3. Start the system from the OS/2 Install Diskette.
4. At the A: prompt, type:

   ```
   SETDPATH=A:\
   SETPATH=A:\
   ```

5. Put the diskette prepared earlier into drive A and type:

   ```
   RECOVER C:filenames
   ```

RECOVER does not work on drives that have an ASSIGN, JOIN, or SUBST command in effect. Also, RECOVER does not work on network drives.

Note: Use RECOVER with a specific file name or group of file names to ensure that only the specified files are recovered and that other files on the target disk will maintain their integrity.

10.5.3.1 Extended Attributes

RECOVER will attempt to recover the clusters that contain the extended attributes of a file. An extended attribute is a special area used for storing data that describes the file to the system or to an application. If errors occur in any extended attribute chain, RECOVER writes extended attribute information into a file that follows this naming format:

```
EAnnnn.REC
```

Where nnnn is a sequential number starting with 0000. The data from any bad sector appears in the file as zeros; the original recovered file no longer contains extended attributes. RECOVER also recovers the file or directory associated with the extended attribute chain and places it in a file that follows this naming format:

```
FILEnnnn.REC.
```

Where nnnn corresponds to the number shown in the EAnnnn.REC file name.

When recovering files or directories that have extended attributes, be sure to use OS/2 to ensure all extended file attributes are recovered.

10.5.3.2 RECOVER Usage

To recover a file named ADDRESS.FIL in the root directory of drive A, enter:

```
RECOVER A:\ADDRESS.FIL
```

To recover all the files on drive A, enter:

```
RECOVER A:
```

To recover files on a drive that is the hard disk from which you normally start the operating system, follow these steps:

1. Insert the system installation diskette in drive A.
2. Restart the system. At the Logo panel, remove the installation diskette and insert diskette 1. Press Enter to continue.
3. At the first text panel that appears (Welcome to OS/2), press Esc.
4. If the drive containing the files to be recovered is a drive formatted for HPFS, the file UHPFS.DLL has to exist on the same diskette as CHKDSK, or UHPFS.DLL has to exist in a directory in the LIBPATH statement. To display the LIBPATH statement, enter:

   ```
   TYPE \CONFIG.SYS
   ```

   in the drive of the disk that the system started from.
5. In order for the system to display error messages, the file OSO001.MG has to be on the same disk as CHKDSK or it has to exist in a directory in your DPATH statement. To display your DPATH statement, enter `DPATH` at the command line.
6. Run RECOVER in drive A, while specifying the letter of the drive containing the files to be recovered.

10.5.4 MAKEINI Command

The MAKEINI command is used to recreate the system files, OS2.INI and OS2SYS.INI. These contain system settings, such as application defaults, display options, and file options. The OS2.INI startup file is located in the C:\OS2 directory of your hard disk. There is also a system file called OS2SYS.INI, which contains information about installed fonts and printer drivers.

10.5.4.1 MAKEINI Usage

If you receive a message stating that the OS2.INI file is corrupted, the OS2.INI file installed on your system must be replaced by another valid copy of the OS2.INI file.

Note: You can rename the OS2.INI and OS2SYS.INI files to names of your choice as long as the same file names are reflected in the PROTSHELL statement in the CONFIG.SYS file.

The syntax of the command is as follows:

```
[drive][path]MAKEINI Target Source
```

Creating New INI Files

1. Insert the Installation diskette in drive A; then press Ctrl+Alt+Del to restart the system.
2. When the panel displaying the logo appears, remove the Installation diskette and insert diskette 1 into drive A.
3. Press Enter to continue.
4. Press Esc when the Welcome to OS/2 panel appears.
5. To change to drive C, enter:

   ```
   C:
   ```

6. To change to the OS2 subdirectory, enter:

   ```
   CD \OS2
   ```

7. To erase the current OS2.INI file, enter:

   ```
   ERASE OS2.INI
   ```

8. To erase the current OS2SYS.INI file, enter:

   ```
   ERASE OS2SYS.INI
   ```

9. To re-create a new user INI file, enter:

   ```
   MAKEINI OS2.INI INI.RC
   ```

10. To re-create a new system INI file, enter:

    ```
    MAKEINI OS2SYS.INI INISYS.RC
    ```

11. Remove diskette 1 from drive A.
12. Restart the system by pressing the Ctrl+Alt+Del.

10.5.4.2 Lockup Password Reset

The MAKEINI command is also used to reset the Workplace Shell screen lockup password if it is unknown, or has been lost.

The syntax for the command is:

```
MAKEINI OS2.INI LOCK.RC
```

This command resets the password to the default of No Password.

Chapter 11. Help Functions and Support Tools

OS/2 Warp 4 includes an excellent integrated, context-sensitive Help facility called WarpGuide. As part of this online help documentation, OS/2 Warp 4 also includes troubleshooting and problem determination utilities.

The printed documentation has been kept to a minimum for environmental purposes. The main purpose of this documentation is to provide information on the installation of OS/2 Warp 4 and general user steps for getting started with the desktop.

All online documentation is located in the Assistance Center folder on the desktop.

11.1 Assistance Center Folder

The Assistance Center folder is one of the default folders installed during installation. The contents of this folder are shown in Figure 451.

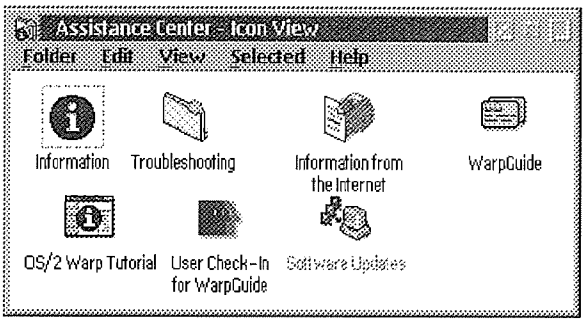

Figure 451. Assistance Center Folder

This folder is located on your Workplace Shell desktop, and contains not only documentation for the OS/2 Warp 4 operating system itself, but also documentation describing any networking components you selected as part of OS/2 Warp 4. The Assistance Center folder also contains references to other sources of information such as *Information from the Internet*, *WarpGuide*, etc.

11.1.1 The Online Tutorial

The OS/2 Warp 4 Tutorial supplied with OS/2 Warp 4 has been revised, and provides a lot of information in addition to that given by previous versions. The tutorial is divided into four sections as shown in Figure 452 on page 798.

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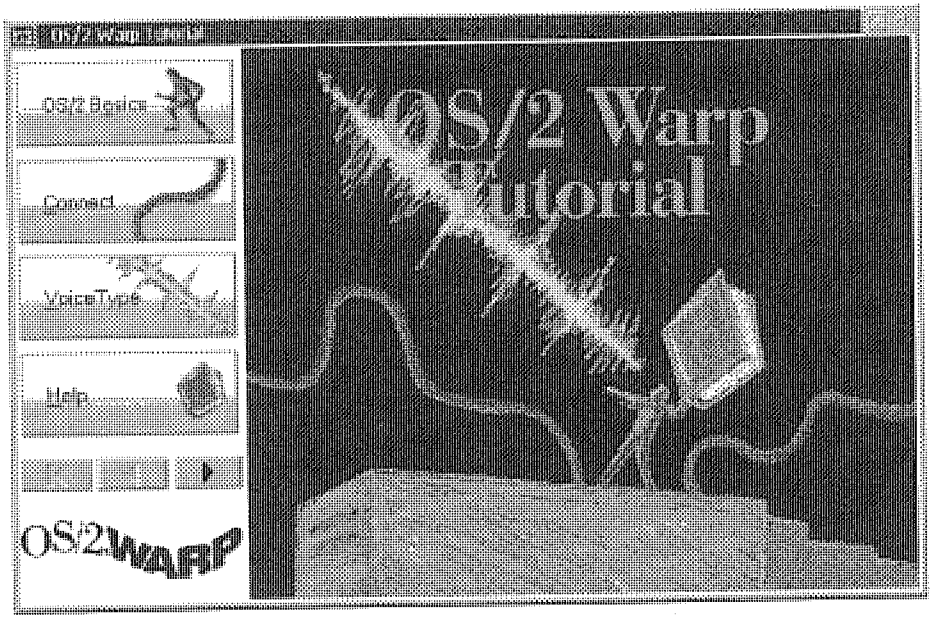

Figure 452. OS/2 Warp 4 Tutorial

1. **OS/2 Basics**, where you are shown how to:
   - Perform basic OS/2 operations such as opening and closing objects, moving and sizing windows, displaying context menus, using the WarpCenter, and shutting down your system
   - Run programs
   - Customize your system by changing colors and fonts
   - Create new objects including programs, data files, folders and printers
   - Use multimedia objects
2. **Connect**, where you are shown how to set up and use:
   - Networking basics
   - File transfer
   - World Wide Web connections
   - The File and Print Client
   - Mobile Office Services

3. **VoiceType**, where you are shown how to set up and use:
   - VoiceType basics
   - Navigation
   - Dictation
   - Recognition
4. **Help**, where all the help facilities available in OS/2 Warp 4 are explained, such as:
   - Readme files
   - Using F1 help
   - Help index
   - WarpGuide
   - Online books

If you are a new OS/2 Warp 4 user, the tutorial is the best way to become familiar with the system. If you are an experienced OS/2 Warp 4 user, then the tutorial in this version will acquaint you with most of the new features.

11.1.2 Information

Within the Assistance Center folder, you will find the Information folder as shown in Figure 453.

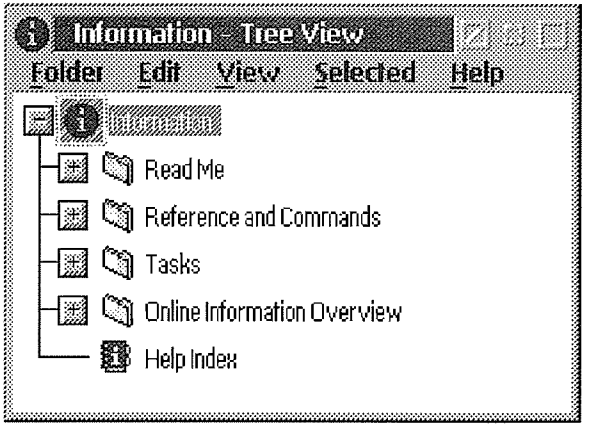

Figure 453. Information Folder

This folder contains the online documentation for OS/2 Warp 4, and is the primary source of reference for how-to type questions.

11.1.2.1 Help Index and Glossary

Within the Information folder, you will find the Help Index in the Help Index folder and the Glossary in the Online Information Overview folder (see Figure 453 on page 799). These documents act as useful references to help you find information, and are a good starting point whenever you want to know something about your OS/2 Warp 4 system.

The Help Index and the Glossary are not, in themselves, documents. The Help Index links the indexes of every document in the Information folder together in one handy reference. For example, you might want to know how to log on to a server. The Help Index will give you pointers to information in any of the online documents in your OS/2 Warp 4 system, provided these documents reside in a directory that is included in the SET HELP= statement in your OS/2 Warp 4 CONFIG.SYS file. All of OS/2 Warp 4's own online documents are included in this statement automatically, and most applications will add their own directories to this statement during installation.

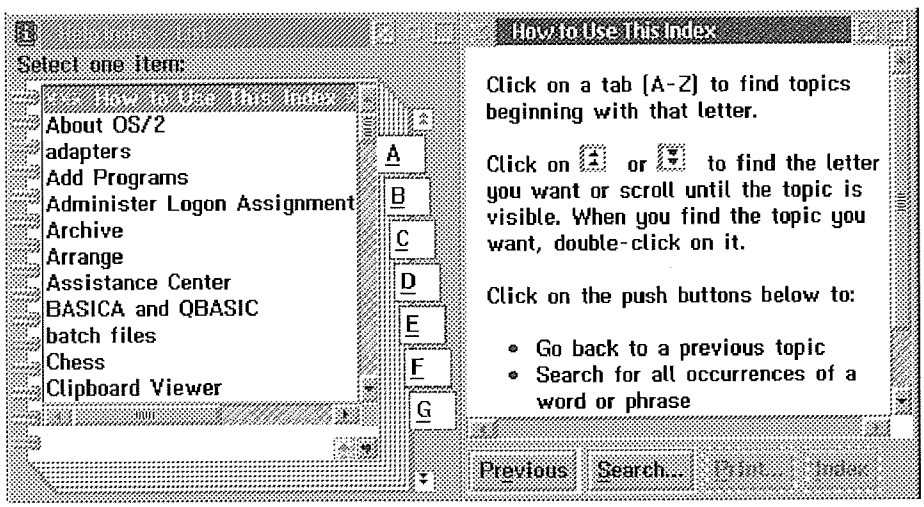

Figure 454. Help Index

The Glossary explains many of the terms used throughout the online documentation.

For the More Advanced User

If you are an application developer, you will probably create online help files and documentation for your application. You can produce such files using the IPF Compiler (IPFC), which is available in the *Developer's Toolkit*. To add your help file indexes to the Help Index, simply add the directory where your help files reside to the SET HELP= statement in OS/2 Warp 4's CONFIG.SYS file.

11.1.2.2 Online Reference Books

If you already have an idea where you want to look for help on a particular topic, you can go directly to the online document that deals with that subject. OS/2 Warp 4 provides a number of different documents on all the features available in your OS/2 Warp 4 system, and these can be found in three folders that reside in the Information folder (see Figure 453 on page 799). They are:

1. The Readme folder
2. The Reference and Commands folder
3. The Tasks folder

Each of these folders is briefly described below.

The Readme Folder: This folder contains Readme documents on specific OS/2 Warp 4 features that you have installed. These documents often contain helpful information about a product or feature, such as:

- Installation tips
- Any expected problems
- Any omissions or errors in the documentation

Note!

Not all Readme files are in this folder. To find all such files, you can use OS/2 Warp 4's Find Objects utility (available from the Find... item on the context menu of most Workplace Shell objects). In the Name field, enter `*read*` and select the **Save Results** check box. When you select the **Find** button, your system will be searched for matching objects and a folder containing the results of the search will be displayed on your desktop.

Some readme files are not copied to your hard disk during installation. It may well be worth using the same method shown above to search for such files on your OS/2 Warp 4 CD-ROM.

The Reference and Commands Folder: This folder contains reference or lookup documents that you can read and search online. One of the most important of these online documents is the *OS/2 Command Reference*, as shown in Figure 455.

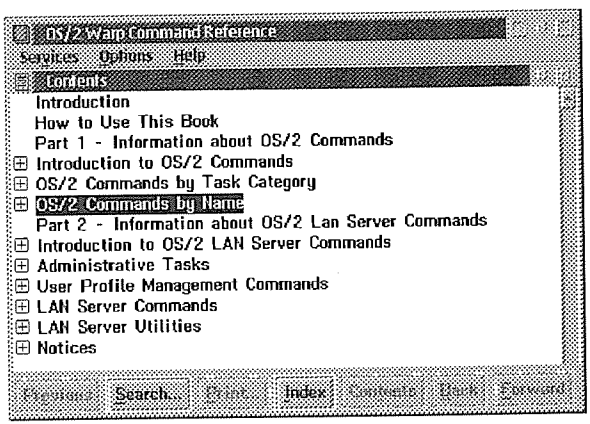

Figure 455. OS/2 Command Reference

While OS/2 Warp 4 lets you perform most tasks by manipulating Workplace Shell objects with your mouse, it is occasionally useful to use a command line. The *OS/2 Command Reference* describes all of the commands that you can issue from a command line under OS/2 Warp 4. If you have used DOS in the past, many of these commands will already be familiar to you. However, there are some commands available under OS/2 Warp 4 that are not available under DOS.

For example, the following commands can be used in an OS/2 window or full-screen session, but not in a DOS session:

- SYSLEVEL - provides version information about the components of OS/2 Warp 4
- RECOVER - provides an interface for retrieving files from problem sectors on a disk

The *Command Reference* is divided into two sections. The first section lists commands in alphabetical order by name, and the other lists them by task category.

These two listings allow you to search for commands in different ways. For example, if you know the name of the command you want to issue, and you only need to know some additional information such as a parameter or keyword, you can use the name-based listing to find the command.

Sometimes, however, you might not know the name of the command. For instance, you might know that you want to copy a subdirectory on your hard disk, but not know the command to do so. In this case, you could use the category-based listing and look under "Disk and Diskette Management" within the *OS/2 Command Reference*.

Note that the *OS/2 Command Reference* also contains File and Print Client commands. While you can perform most tasks with the File and Print Client using Workplace Shell objects, you can use a command line to perform these tasks if you wish. This option becomes useful if you wish to automate a series of commands into a command file.

Help When You Need It

If you are working in an OS/2 command line session and you need help for a particular command, just enter `HELP [Command name]`. For example, if you require help with the XCOPY command, type `HELP XCOPY` and OS/2 Warp 4 will display a window with the requested information.

11.1.3 WarpGuide

In the Assistance Center folder, you will see a WarpGuide object (see Figure 451 on page 797). WarpGuide is a proactive guidance system that often uses cue cards to help you complete a task. It also has wizard-like interfaces for some tasks. Whenever you open an object for which WarpGuide contains information, a WarpGuide button appears on the title bar of the window for that object.

11.1.3.1 WarpGuide Register

The very first time you open such an object, WarpGuide will ask you to register or check in, indicating your level of experience with computers and OS/2 Warp 4. The level of experience that you indicate will determine the kind of information WarpGuide presents to you and how it presents it:

- If you check **I'm unfamilar with computers**, WarpGuide automatically shows you cue cards and shades the unneeded parts of the window. The shading does not change the way a window works. You can still click on the areas under the shading.
- If choose **New to OS/2**, WarpGuide still automatically shows the cue cards, but doesn't use shading. It also gives more advanced information in the cue cards.
- If you indicate that you are familiar with OS/2, cue cards are not shown automatically, but you can access a cue card for the current task if you wish, by clicking on the **WarpGuide** icon on the window's title bar. Cue cards at this level are usually tips and advanced techniques.

Figure 456 on page 805 shows the User Check-In for WarpGuide window, with the WarpGuide cue set to Novice.

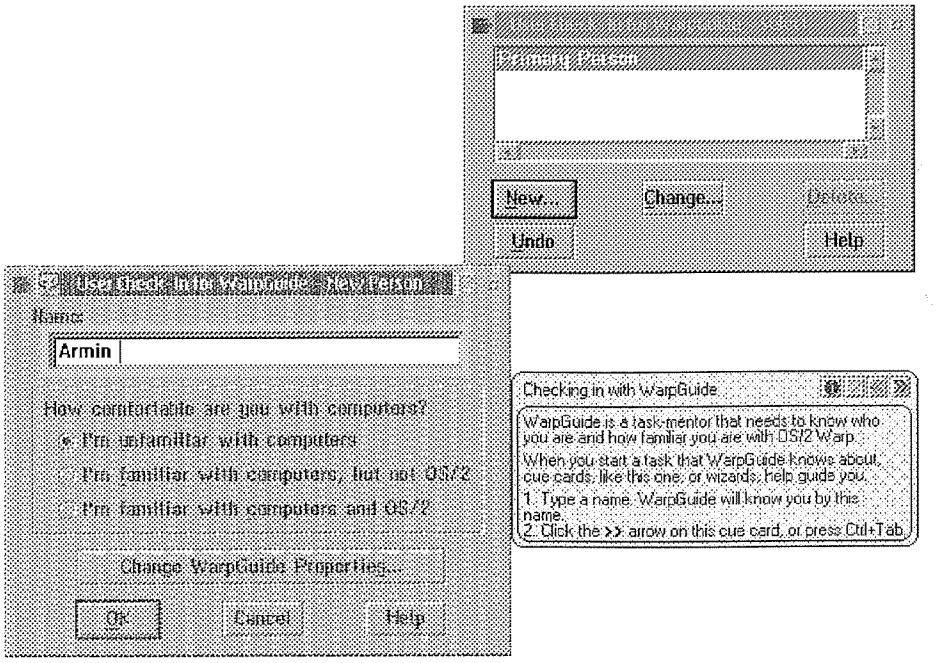

Figure 456. WarpGuide - Example

Each cue card includes a set of buttons located on the upper-right corner:

- If you want more information about the current task, click the **Information** button to access the other cue cards available to you for the current step in the task.
- To move to the next or previous step in a task, click the right or left arrows. WarpGuide automatically moves to the next step and, in some cases, even turns a notebook page to do it.
- To move a cue card on the panel, use the right mouse button and drag it as in any other drag-and-drop operation.
- To remove a cue card, click **Close**.

By default, WarpGuide is set to provide assistance for someone who is familiar with computers but not with OS/2 Warp 4. WarpGuide creates a profile for you based on that assumption, but allows you to change that profile when you first use WarpGuide. The default user's name is *Primary Person*, but you can change this name if you wish. WarpGuide will continue to keep track of *Primary Person* or any other name you select, and adapt its cue cards and behavior as you gain experience.

If many persons use your OS/2 Warp 4 system, you can set up multiple user profiles so that when one person checks in, that person's personal WarpGuide profile is used. You can do this using the User Check-In for WarpGuide utility, as shown in Figure 456. There are no limits on the number of users WarpGuide keeps track of.

This utility allows you to add or delete users, change to a new user, or change a user's name. You cannot change the proficiency level for a user. The user must be deleted and then recreated.

11.1.3.2 Configuring WarpGuide

You can configure WarpGuide, or even turn it off altogether, by displaying the properties for the WarpGuide object in the Assistance Center folder or clicking the **Guidance on the WarpGuide** object, which you will find if you open the WarpGuide object. In either case, you will see the WarpGuide Properties notebook as shown in Figure 457.

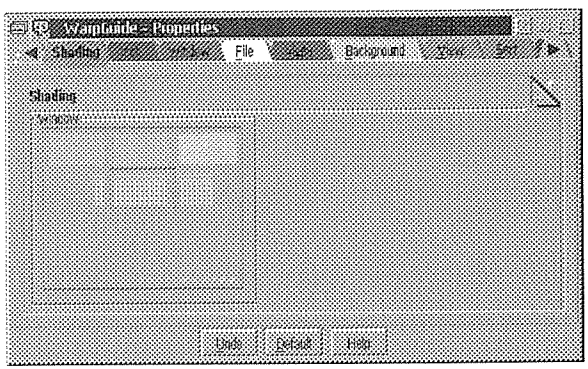

Figure 457. WarpGuide - Properties

You can turn off WarpGuide by deselecting the **Assist me with selected tasks** check box on the Appearance tab. You can adjust the shading using the Shading tab.

11.1.4 Help for System Messages

There will be times when you will be confronted by certain system messages. These system messages usually take the format of three alphabetic characters, immediately followed by four numeric characters, and are often somewhat cryptic.

For example, if you try to access your diskette drive when there is no diskette in the drive, you will receive a system message SYS0021. If you would like more

information on this message, enter the command `HELP SYS0021`, as in the following example:

```
[C:\]dir a:

SYS0021: The drive is not ready.

[C:\]help sys0021

SYS0021: The drive is not ready.

EXPLANATION: One of the following errors occurred:
o  The drive is empty.
o  The drive door is open.
o  The drive is in use.

ACTION: Do one of the following and retry the command:
o  Insert a diskette in the drive.
o  Close the drive door.
o  Wait until the drive is available.
```

11.1.5 AskPSP

One way of resolving problems is to use AskPSP, a new expert system that allows you to obtain answers concerning OS/2 Warp 4 and IBM server products. AskPSP effectively becomes your own personal help desk.

To use AskPSP, simply follow these steps:

1. Within the Assistance Center folder, you will find the Troubleshooting folder from which you can open the AskPSP object.
2. OS/2 Warp 4 will display messages indicating that CasePoint products are starting. AskPSP will automatically load the OS/2 Warp 4 and BonusPak CaseBase WCTHDESK. This is an organized database of support information, that you can search to find the answers you want.
3. In the Description area of the CasePoint panel, type the description `How to use CasePoint` and then press the Enter key. This starts a search of the case base.
4. When the search is complete, open the first entry in the Actions area of the panel. This displays an online information unit that describes how to use CasePoint. You can browse, search, or print this file as needed.
5. To exit from this file, click on the top left corner of its window.

To clear the information from the panel before you begin a new search, you can:

- Press Ctrl+N

- Select the **Red Eraser** icon
- Select **New Search** from the Search pull-down menu.

The information is cleared from the panel, and you can now type a problem description or question.

The advantage of using AskPSP is that you can ask a plain-English question from which the CaseBase will ask you a series of additional questions that guide you to a potential solution. In this way, you can use AskPSP and find answers, even if you are not entirely sure of the questions you should be asking.

11.1.6 Support from the Internet

Within the Assistance Center and Troubleshooting folders, you will find three objects that you can open when you are connected to the Internet. These objects are:

- Information from the Internet
- Software Updates
- Support through the Internet

These three objects will each open a World Wide Web page, from which you can download bug fixes or software updates for your OS/2 Warp 4 system, and search the latest information on how to work with OS/2 Warp 4.

11.2 Support Tools

Contained within OS/2 Warp 4 are troubleshooting and problem determination tools to aid in the resolution of system problems.

11.2.1 The Troubleshooting Folder

Within the Assistance Center folder, you will find the Troubleshooting folder as shown in Figure 458 on page 809.

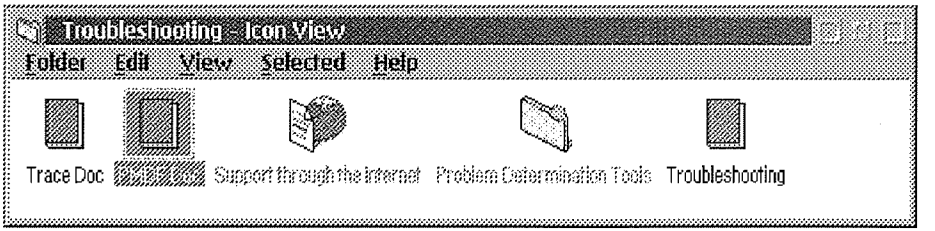

Figure 458. Troubleshooting - Icon View

This folder contains several objects designed to assist you with problem determination:

- **AskPSP** provides an expert Helpdesk system allowing questions to be asked. See 11.1.5, "AskPSP" on page 807 for more information.
- **Support through the Internet** will give you access to IBM Software support advice on the Internet when connected.
- The **Troubleshooting** online manual provides advice and guidance for problem determination.
- The **Problem Determination Tools** folder contains a number of tools to help you diagnose problems.

The Problem Determination Tools folder contains a number of objects as shown in Figure 459.

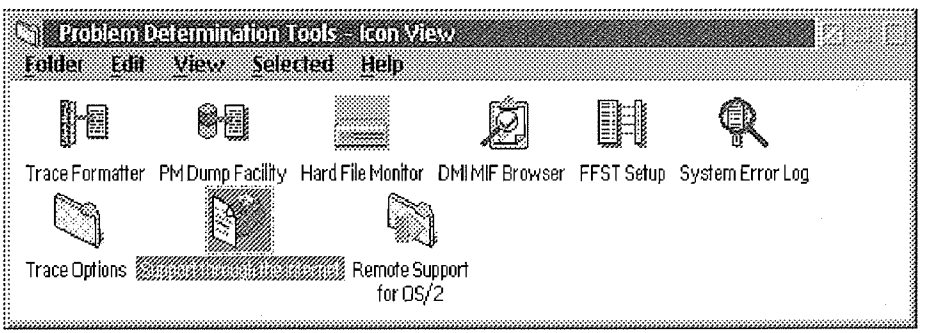

Figure 459. Problem Determination Tools - Icon View

11.2.1.1 System Error Log

For certain key procedures such as installation, network connection and so on, OS/2 Warp 4 keeps track of progress in files called *log files*. You can use the System Error Log utility to view these files, in order to see what is happening in your system and determine the cause of many problems.

The System Error Log is a summary of records that contain detailed information about:

- The state of a program when an error occurred
- Possible causes for the error
- Possible solutions for the error

The System Error Log summary is used to display this information, as shown in Figure 460.

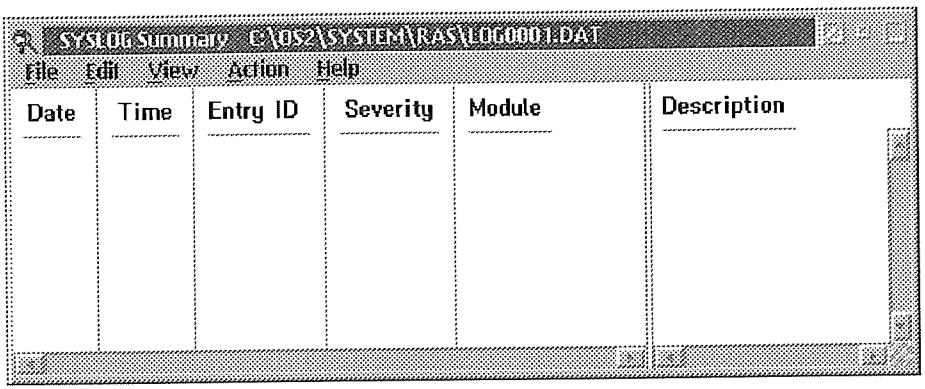

Figure 460. System Error Log - SYSLOG Summary

11.2.1.2 Field Descriptions

The Date field displays the date when the error log entry was created. This field can only be viewed, not changed in any way.

The Time field displays the time when the error log entry was created. This field can only be viewed, not changed in any way.

The Entry ID field in a DET1 record displays the number assigned to each entry in the System Error Log. Error log entries are assigned unique entry IDs, even when they are created by the same probe and contain the same information.

The first entry in the error log is number 1. The system assigns the next higher number to each subsequent entry as it is created. The most recent error log entry is the one with the highest number entry ID. This field can only be viewed, not changed in any way.

The Severity field displays a number from 1 to 6, indicating the severity of the error. You can only view this field.

Severity	Meaning
1	Either a change was made to error logging resulting in a control record, or the log entry was created by a back level logging system.
2	A critical error occurred from which the program cannot recover. If event trace has been enabled (by typing `TRACE ON` at the OS/2 command prompt), trace data exists for this error.
3	A major error was caused by one of the following: • A device or product is unavailable. • The performance of a device or product is below an acceptable level. If event trace has been enabled (by typing `TRACE ON` at the OS/2 command prompt), trace data exists for this error.
4	A minor error occurred. The program has recovered after multiple attempts. Correct the problem to prevent a more serious error from occurring. If event trace has been enabled (by typing `TRACE ON` at the OS/2 command prompt), trace data exists for this error.
5	A potential error exists that could affect the program.
6	An error condition exists, but the severity of the error cannot be determined.
0	No error occurred. Data was collected for informational purposes only.

The Module field displays the name of the component in which the error occurred. If the entry is a control record, this field is blank. You can only view this field. This field is not available in DET4 records created by a back level logging system.

The Description field displays a brief explanation of the error that created the error log entry. You can only view this field.

11.2.1.3 Trace Formatter

The Trace Formatter utility is used in problem determination to set system tracing, or to trace a specific system event.

Note

Tracing is a complex process, and should only be used by advanced OS/2 Warp 4 users.

To use tracing, you must have the following statement in your CONFIG.SYS file:

```
TRACEBUF=63
```

TRACEBUF specifies the size of the trace buffer that you wish to use. This should be given a value between 0 KB and 63 KB. The default for TRACEBUF is 4 KB. The trace formatter is used to format and view a trace.

To switch tracing on and off while your system is running, you use the objects in the Trace Options folder as seen in Figure 461.

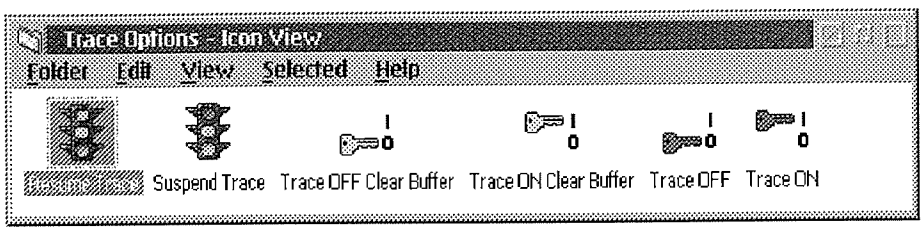

Figure 461. Trace Options

With tracing turned on, the system trace will continuously execute and the trace buffer will fill very quickly. This can also impact system performance, as the system is continually having to log each action being traced. When the trace buffer fills, the system wraps and starts filling the buffer once more from the top. For these reasons, you need to ensure that you trace only the specific items that you need to identify the problem and that you remember to switch trace off once the problem has been reproduced. A 63 KB buffer does not take long to fill when the entire OS/2 Warp 4 system is being traced. Each mouse movement and each keyboard stroke will be logged, including all of the operating system calls made to ensure that the correct action took place.

Figure 462 on page 813 shows an example of a system trace.

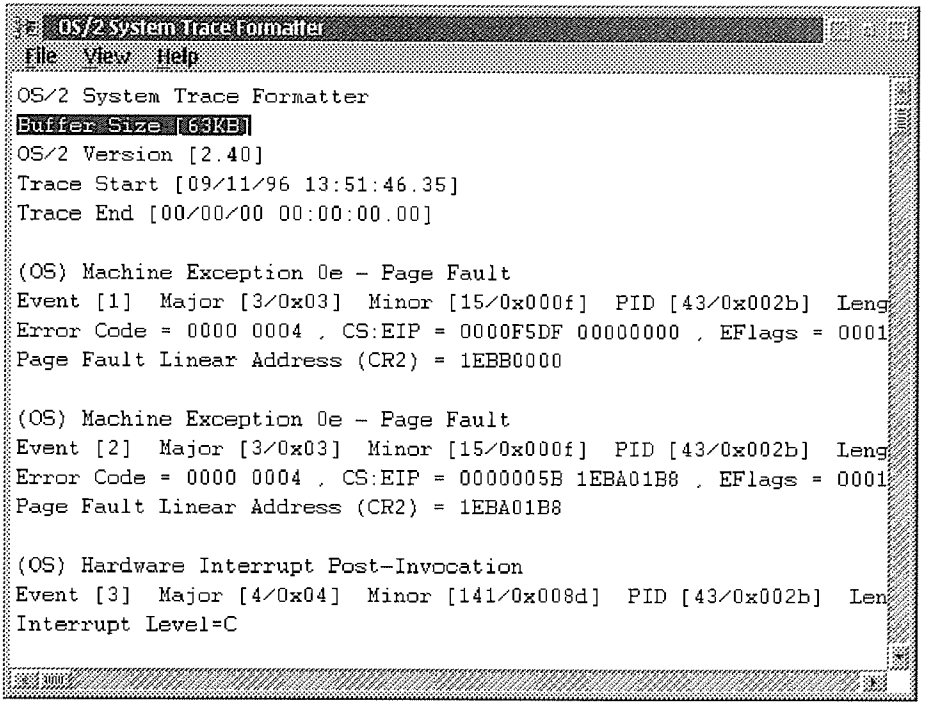

Figure 462. System Trace Example

Note: Located within the Troubleshooting folder is online documentation called *Trace Doc*. This provides in-depth, detailed information on the trace options using static and dynamic tracepoints.

11.2.1.4 System Dumps and the Dump Formatter

The Dump utility is included with OS/2 Warp 4 to help gather information about application or system problems. The Dump utility takes a *snapshot* of the entire physical memory of your system at the time a failure occurred.

OS/2 Warp 4 includes a dump formatter called the PM Dump Facility, along with documentation called *PMDF Doc* in the Troubleshooting folder to help you use the PM Dump Facility utility and the formatter. The PM Dump Facility includes procedures to automatically look at many of OS/2 Warp 4's internal control and data structures, and will assist a support specialist in discovering exactly what caused a particular failure.

IBM OS/2 Warp 4 support can supply a copy of the *debug kernel*, which is a special version of the OS/2 Warp 4 operating system kernel. The debug kernel allows a technical support specialist to connect via modem to your computer and investigate a failure. This is similar to working with a dump, with the added benefit of being able to single-step through a program, instruction by instruction, to find the failure. The PM Dump Facility can be used for this task as well as for reading normal dumps.

When collecting dumps, there are a number of CONFIG.SYS entries that you can use to assist in taking system dumps. These are explained below.

TRAPDUMP: The TRAPDUMP statement is placed in your CONFIG.SYS file, to determine when a dump is to be taken and where the dump should be placed. There are three possible entries:

TRAPDUMP=OFF, X: Indicates that no automatic dump should be taken and that any dump that is explicitly forced by the user should be placed on drive X. The default is TRAPDUMP=OFF.

TRAPDUMP=ON, X: This will automatically generate a system dump for any ring 3 or ring 0 trap, and the dump will be stored on drive X.

TRAPDUMP=R0, X: This will automatically generate a system dump for any ring 0 trap or internal processing error, and will store the dump on drive X.

Because of the protection mechanisms used by OS/2 Warp 4, most applications such as the Workplace Shell, Lotus 1-2-3, etc., run at Ring 3, the least privileged level of execution in the Intel processor. The OS/2 Warp 4 operating system kernel and device drivers run at ring 0, the most privileged level.

You can force a system dump at any time by pressing Crlt+Alt+Num Lock+Num Lock or Crtl+Alt+F10+F10.

You can store a dump on a hard disk or on diskette. To store a dump on a particular drive, the drive must:

- Be larger than the amount of memory in your system
- Have a volume label (set using the LABEL command or the label option in the FORMAT command) of SADUMP
- Be formatted using the FAT file system
- Be located within the first 1023 cylinders of your hard disk

If no drive is specified or the system finds a problem when trying to dump to the drive specified, the dump will default to diskette.

DUMPPROCESS: You can place a DUMPPROCESS statement within your CONFIG.SYS file, to automatically dump information specific to one process (that is, one application) in your system. This information is written to a dump file if and when that application traps. A process dump can only take place for Ring 3 traps, but can be done very quickly since it involves only a small amount of data.

To set this feature on, include the following line in your CONFIG.SYS file:

```
DUMPPROCESS=X:
```

A file called PDUMP.000 will be created on drive X if this is the first process dump to be saved to that drive. The extension of the PDUMP file increments by one each time a process dump is saved. After the dump has taken place, the application will end but OS/2 Warp 4 will continue to function.

You can use the PM Dump facility to view and analyze process dumps.

REIPL: The REIPL statement will automatically restart your system if a system trap or internal processing error occurs. This means that you do not need to manually restart your system in the event of a Ring 0 trap; OS/2 Warp 4 can do this automatically. The format of the command is:

```
REIPL=ON
```

This option can be useful if you leave your system turned on for an extended period while you are not around. For example, you might want to leave your office system turned on so that you can access files remotely from home via a dial-up link. If something happens and your system malfunctions while you are not there to restart it, OS/2 Warp 4 will restart automatically.

SUPPRESSPOPUPS: You can use the SUPPRESSPOPUPS keyword in your CONFIG.SYS file to suppress the display of any trap information on your panel, and to direct the output to a file. To use this feature, place the following statement in your CONFIG.SYS file:

```
SUPPRESSPOPUPS=X:
```

This will suppress trap information for Ring 3 applications (for example, SYS3175 errors), and will create a file on the root directory of drive X: called POPUPLOG.OS2. If a trap occurs, the trap panel information will be dated, time stamped and appended to the POPUPLOG.OS2 file.

This is an extremely useful way of obtaining the trap panel information to assist with problem diagnosis, as you do not need to read the trap panel information and repeat it to a support specialist. You can simply reproduce the failure, copy the resulting file to diskette and send it to the support person.

11.2.1.5 Hard File Monitor

The Hard File Monitor uses a technology known as Self-Monitoring, Analysis, and Reporting Technology (SMART) to monitor the status of hard disk drives in your computer. A hard disk drive must be SMART-compatible for the Hard File Monitor to be able to detect potential failures in that drive.

If the Hard File Monitor indicates that a drive has a potential failure condition, you should back up that drive immediately to avoid losing valuable software and data if the drive actually fails.

Note, however, that the Hard File Monitor *may not* detect all possible failures, and *should not* be used as a substitute for regular backups of your disk. Hard drives can fail for reasons that are not predictable when using SMART. In some situations, the Hard File Monitor cannot detect a potential failure condition soon enough to allow you to back up the drive before it fails. For this reason, you should always make regular backup copies of your critical files.

11.2.1.6 DMI MIF Browser

The DMI MIF Browser is a desktop tool for managing hardware and software products that conform to the Desktop Management Interface (DMI) standard. MIF is the Management Information Format (MIF).

With the DMI browser you can:

1. Dynamically register and unregister with the DMI service layer
2. Install and uninstall component MIF files in the service layer
3. View events issued by the service layer
4. View a hierarchical representation of the groups and attributes of each component MIF that you have installed

The DMI browser displays a graphical representation of the component MIFs that are currently installed on your system. The components and groups on your system are represented in the DMI browser by icons, as shown in Figure 463 on page 817.

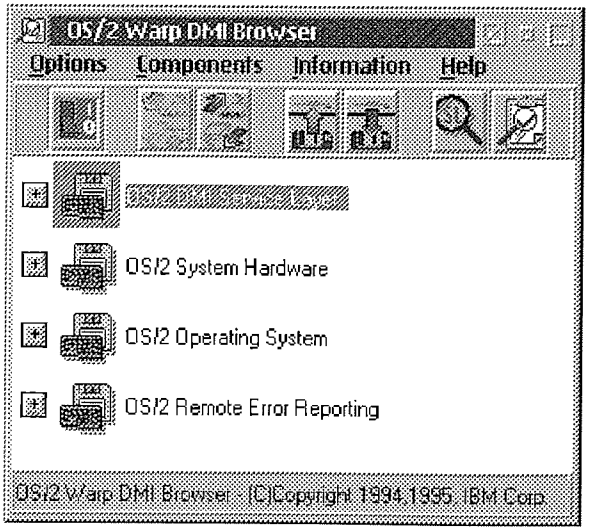

Figure 463. DMI Browser

11.2.1.7 Remote Support for OS/2

The Remote Support for OS/2 folder is located within the Problem Determination Tools folder, and contains a number of objects, as shown in Figure 464.

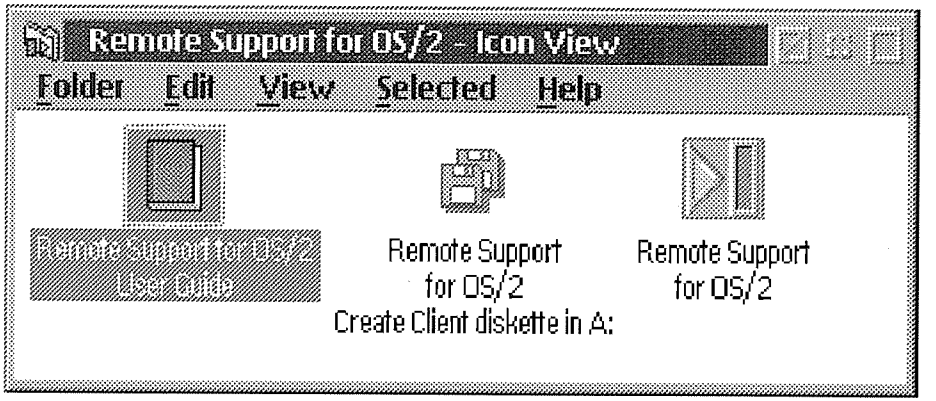

Figure 464. Remote Support Folder

Remote Support for OS/2 allows an IBM technical support person to remotely take control of your OS/2 Warp 4 system. Once the connection is established, the support person can use your system just as if he or she were sitting in front of your computer. The support person can execute programs, edit files and even reboot your system.

Remote Support for OS/2 allows a support person to resolve problems more quickly and easily by:

- Watching your actions on the panel as you re-create a problem
- Uploading/downloading files or clipboard information for problem determination
- Taking control of your system to:
  - Modify configuration files
  - Upload updated code such as device drivers, applications, etc.
  - Teach you how to perform certain tasks, while you watch your panel

When Remote Support is ready, you will see the panel shown in Figure 465.

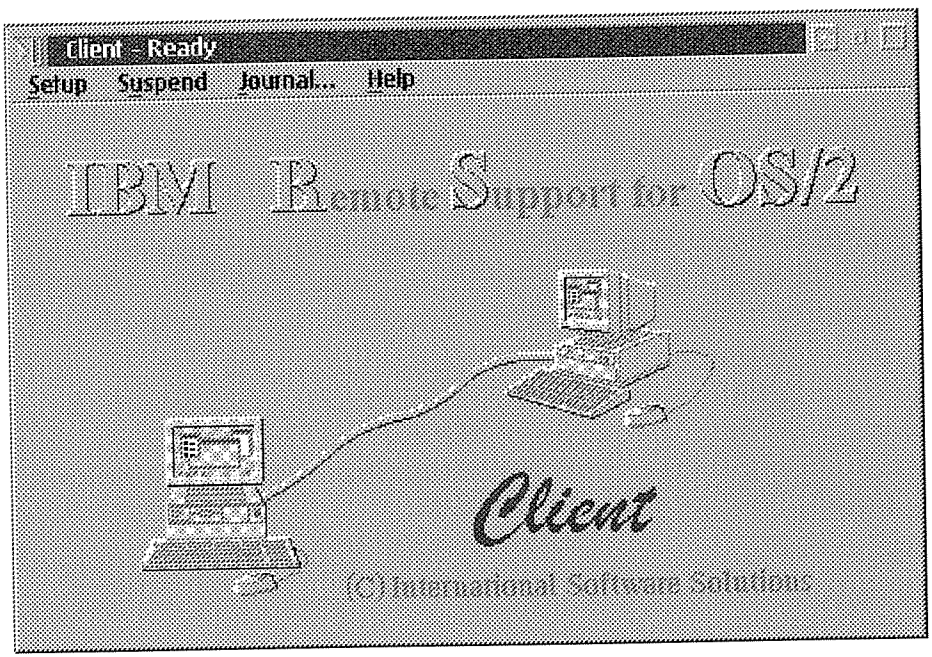

Figure 465. Remote Support Client - READY

Remote Support for OS/2 requires a modem, and is intended for use exclusively with the assistance of IBM technical support personnel. It includes a security feature so that nobody can connect to your system without your knowledge and consent.

Remote Support for OS/2 consists of two parts:

- The client, which you run on your OS/2 Warp 4 system
- The manager, which is run by an IBM support person on his or her system, and which connects to the client software on your system.

The client is an OS/2 program that you must load on your system in order to use Remote Support for OS/2. There is a minimal amount of configuration required; you only need to select the name/type of modem attached to your computer. The client software includes a removal program so that you can remove it from your system if you wish.

When you install the client on your system, you can activate it to call or receive a call from the manager. When you connect to the manager or when the manager connects to your system, you will see a dialog box asking you to confirm that you want IBM to access your system. This provides security for both the support person and for the owner of the PC.

Note that even when you have granted access to the support person, you will always see exactly what he or she is doing on your system. You can suspend the support person's control of your system at any time.

Both the manager and client support all video resolution modes supported by OS/2. The resolution mode of the client is independent of the manager, so the manager will be able to see and manipulate the client even if they are in different graphic resolution modes.

Remote Support for OS/2 allows a support person to transfer files to or from your system. This means that he or she can load a new copy of a corrupted command file or configuration file into your system. The support person can also access your clipboard and transfer information to or from your system.

Remote Support for OS/2 includes a *chat mode*, which allows you and the support person to communicate during the remote-control session. Chat mode allows you to send audio (voice) traffic as well as text, provided you have the appropriate hardware in your computer to support voice capture and playback. You can suspend the support person's control of your system at any time, and jump into chat mode to make a comment or ask a question.

The support person can use a powerful *marker mode* to draw and/or write directly onto your desktop. For example, the support person may draw a circle around a particular area within a window, to highlight something that he or she wishes to explain. Any text or lines that the support person draws appear only on your panel, and do not affect the operation of OS/2 Warp 4 or your applications.

Remote Support for OS/2 maintains a journal on both your system and the manager system. This journal records all files transferred, any dialog during chat mode and any comments the support representative chooses to add. The journal allows you to keep track of everything that takes place while the support person is connected to your system.

The procedure required to set up Remote Support for OS/2 is clearly documented in the online *Remote Support for OS/2 User Guide*, along with instructions for using all of the features discussed above.

For situations where you cannot correctly start OS/2 Warp 4 to work with the Workplace Shell, Remote Support for OS/2 provides the Remote Support for OS/2 Create Client Diskette in A: utility. This utility allows you to boot to a command prompt (either from diskettes or from the Recovery Choices panel) and run the RS2 program from your A: drive to start the Remote Support for OS/2 client.

Note

You must create the diskette before any problems arise, so if you intend to use Remote Support for OS/2, it is a good idea to do this as soon as you install OS/2 Warp 4, just in case you run into problems later.

11.2.1.8 First Failure Support Technology

First Failure Support Technology (FFST/2) is a technology that allows programs to record error information while they are running. This capability is useful because a failure in a system program or application may be difficult to re-create. Capturing information about an error at the time it occurs, for analysis by technical staff, can result in faster problem resolution.

FFST/2 uses *probes*, which are program calls to an application programming interface (API) that captures information about an error and creates an entry in the error log. System programmers and application software developers add probes to their programs to help in diagnosing errors.

A probe always creates an entry in the error log. In addition, a probe can capture the following error information:

- Process status (PSTAT)

  This can include one or more of the following:

  - Current processes and threads
  - System semaphores
  - Shared memory for each process
  - Dynamic-link libraries

- Process environment

  The environmental variables that were in effect when the error occurred.

- Trace information

  A record of key events that occurred while the program was running.

- User data

  Up to 30 storage areas or data structures.

The FFST setup program object in the Problem Determination Tools folder is used to set up and configure FFST. The online help text within this object contains full details on how to use FFST/2.

11.2.2 Software Updates and Fixes

IBM provides fixes for OS/2 Warp 4 by producing *Fix Packs*. A Fix Pack consists of multiple diskettes containing updates to the OS/2 Warp 4 software, which can be applied to your system if required. Fix Packs are released periodically, and are available from IBM via support organizations in each country. There is typically a small cost for the diskettes and shipping, or you can avoid this cost by downloading a Fix Pack from the Internet at no charge.

Note

You should apply a Fix Pack only if you are advised to do so by OS/2 Warp 4 support personnel, or you have searched sources such as the Internet and discovered that this particular Fix Pack may fix an error that you are experiencing on your OS/2 Warp 4 system.

The Retrieve Software Updates utility in the Assistance Center folder will take you to the IBM Personal Software Services home page on the Internet. From this page, you can download the latest OS/2 Warp 4 Fix Pack, as well as fixes and updates for other IBM software products.

To apply a Fix Pack to your system, you will also need the Corrective Service Facility (CSF) Boot Diskettes (available from IBM or from the Internet). Boot your system from the CSF diskettes and follow the prompts to apply the Fix Pack.

The Corrective Service Facility can create an archive of your system prior to applying a Fix Pack, which will allow you to back out of the Fix Pack if it does not meet your expectations.

11.3 Contacting IBM Support

The situation may arise where you encounter an error from which you cannot recover, and your only choice is to contact IBM for support. OS/2 Warp 4 contains a number of features that will enable you to give the support person information about your OS/2 Warp 4 installation and what has gone wrong. Some of these are commands that you can type from the command line, while others include more advanced utilities and CONFIG.SYS options. A brief summary of these is given here.

11.3.1 Determining Software Version Numbers

There are several commands that you can use to determine the version of OS/2 Warp 4 that you are running, as well as the version numbers of various other programs in your system. This is often useful, since the first thing a support person will ask you is which version of the software you have.

11.3.1.1 VER Utility

The VER utility tells you the version of OS/2 Warp 4 that is running in your system. You start the VER utility by issuing the VER command from a command line. You can also use the /R parameter with this command, to tell you the internal revision level of the OS/2 Warp 4 kernel. The VER command is shown in Figure 466.

```
OS/2      Ctrl+Esc = Window List       Type HELP = help

[C:\]ver /r

The Operating System/2 Version is 4.00
Revision 9.025

[C:\]_
```

Figure 466. VER Command

Note that the version and revision level given in the example above are fictitious, and the numbers displayed on your own system will be different.

11.3.1.2 SYSLEVEL Utility

The SYSLEVEL utility displays information about OS/2 Warp 4, its components and other IBM software that you may have installed on your system. To start the SYSLEVEL utility, type SYSLEVEL. Sample output from the SYSLEVEL command is shown in Figure 467.

```
OS/2      Ctrl+Esc = Window List       Type HELP = help

[C:]syslevel



[C:]_
```

Figure 467. SYSLEVEL Command

Note that the SYSLEVEL utility searches your entire system to locate and determine the version numbers of all software components. This information may run to several panels, depending upon the number and type of software products you have installed. You can create a file with all the SYSLEVEL information by typing SYSLEVEL > SYSLEVEL.TXT. The file SYSLEVEL.TXT can then be passed to a support person if necessary.

11.3.1.3 BLDLEVEL Utility

The BLDLEVEL utility allows you to determine the version of a particular program or dynamic link library (DLL) that you are running. You start the BLDLEVEL utility by typing BLDLEVEL.

Figure 468 on page 824 shows an example of the BLDLEVEL command and its output.

```
OS/2      Ctrl+Esc = Window List       Type HELP = help

[C:]bldlevel c:\os2\dll\PMMERGE.DLL
Signature:   @#IBM:9.25#@ OS/2 PM Merged Library
Vendor:      IBM
Revision:    9.25
Description: OS/2 PM Merged Library

[C:]_
```

Figure 468. BLDLEVEL Command

The BLDLEVEL command relies on information placed in the program file by the person who wrote the program. This command works for OS/2 programs only, not for DOS or Windows programs. Developers *should* place the necessary information into their programs and most, though not all, do so. When the information is not provided by the developer, you will receive an error message similar to the following:

```
Error: Could not find the signature in C:\OS2\DISKCOPY.COM
```

Note that while the SYSLEVEL utility is used to gain information about entire system components (such as the Workplace Shell), the BLDLEVEL utility displays information about a specific program file.

11.3.2 Traps

A trap (also known as an *exception*) is caused when a program attempts some kind of invalid action. A trap can be caused by bugs in the program, hardware errors or even errors in the timings of certain events. There are two main types of trap, each with its own symptoms:

- System-critical programs and device drivers run in a highly protected environment, known as Ring 0. If you suffer a trap in a Ring 0 privileged program, OS/2 Warp 4 does not attempt to recover since any such action may compound the problem. This type of trap is also known as an *internal processing error*.

  In these cases, you will see a panel with the following format:

```
TRAP ____ ERRCD= ____ ERACC= ____ ERLIM= ________

 EAX= ________ EBX= ________ ECX= ________ EDX= ________

 ESI= ________ EDI= ________ EBP= ________ FLG= ________

 CS:EIP= ____ : ________ CSACC= ____ CSLIM= ________

 SS:ESP= ____ : ________ SSACC= ____ SSLIM= ________

 DS= ____ DSACC= ____ DSLIM= ________ CR0= ________

 ES= ____ ESACC= ____ ESLIM= ________ CR2= ________

 FS= ____ FSACC= ____ FSLIM= ________

 GS= ____ GSACC= ____ GSLIM= ________

 THE SYSTEM DETECTED AN INTERNAL PROCESSING

 ERROR AT LOCATION ## ____ : ________ - ____ : ________

 _____ , ____

 ________


 INTERNAL REVISION _ . ___ DATE:  __/__/__
```

The "_____" sections will contain numbers in the case of a real Ring 0 trap. If you experience such a trap, you should record *all* the information and contact OS/2 Warp 4 support.

- Applications and some system programs run in a general environment known as Ring 3. When a program suffers a trap in Ring 3, you will normally see a SYS3175 error message. If you choose to display the registers, you will see information similar to the following:

```
09-31-1996  16:27:42  SYS3175  PID 0012  TID 000a  Slot 0044
D:\OS2\PMSHELL.EXE
c000009b
1f34bb09
EAX=03938700  EBX=01397930  ECX=00000000  EDX=00000000
ESI=fffffffb4  EDI=8000006b
DS=0053  DSACC=d0f3  DSLIM=1fffffff
ES=0053  ESACC=d0f3  ESLIM=1fffffff
FS=150b  FSACC=00f3  FSLIM=00000030
GS=0000  GSACC=****  GSLIM=********
CS:EIP=005b:1f34bb09  CSACC=d0df  CSLIM=1fffffff
```

```
SS:ESP=0053:0139768c  SSACC=d0f3  SSLIM=1fffffff
EBP=01397868  FLG=00012246

MMPARTS.DLL 0001:0000bb09
```

This information is very useful if you need to contact OS/2 Warp 4 support. If you are a programmer, it may also assist you in debugging your program.

A list of potential trap error codes and their meaning follows:

TRAP 0000 DIVIDE ERROR: A program attempted to divide a number by zero. Since this is a mathematical impossibility, it usually indicates a bug in the program, or a memory hardware error. Contact software support.

TRAP 0001 DEBUG EXCEPTION: Contact software support.

TRAP 0002 HARDWARE/MEMORY ERROR: You have a failure in your computer's memory or other hardware. Contact hardware support.

TRAP 0003 BREAKPOINT: This is a special instruction (INT 3) used in *debugging* software, which was left in the program either accidentally or by design. Contact software support.

TRAP 0004 OVERFLOW: An overflow occurred during an arithmetic operation. This usually indicates a bug in the program or a memory error. Contact software support.

TRAP 0005 BOUND RANGE EXCEEDED: A bound instruction exceeded the specified limits. This usually indicates a bug in the program. Contact software support.

TRAP 0006 INVALID OPCODE: The processor tried to execute an instruction that did not make sense to your computer's processor. Contact software support.

TRAP 0007 COPROCESSOR NOT AVAILABLE: The program attempted to use a match coprocessor, but you do not have one installed in your computer, or it is not functioning properly. Run diagnostic tests

	on your computer; if the coprocessor diagnostic tests run without errors, contact software support.
TRAP 0008	DOUBLE FAULT: The processor detected an exception while processing another exception. This can be caused by either hardware or software. If you are also getting TRAP 0002 errors, contact hardware support.
TRAP 0009	COPROCESSOR OVERRUN: The middle portion of a COPROCESSOR operand is protected or not present. This usually indicates a bug in the program. Contact software support.
TRAP 000A	INVALID TASK STATE SEGMENT: OS/2 Warp 4 tried to switch to a task, but the required information was either not present in memory, or corrupted. Contact software support.
TRAP 000B	SEGMENT NOT PRESENT: The program tried to access an area of memory that does not exist. This indicates a bug in the program, or a memory hardware error. Contact software support.
TRAP 000C	STACK FAULT: The program tried to access an area in memory, but either the memory page does not exist, or the procedure referencing the page does not have sufficient privilege to access the page. Contact software support.
TRAP 000D	GENERAL PROTECTION EXCEPTION: All protection violations that do not cause another exception cause a TRAP 000D. The most common cause of this error is when a program tries to access an area of memory that is allocated to a different program. Contact software support.
TRAP 000E	PAGE FAULT: The referenced page is not present in memory, or the procedure referencing the page does not have enough privilege to access the page. This normally indicates a bug in the program. Contact software support.
TRAP 000F	RESERVED BY INTEL.

TRAP 0010	COPROCESSOR ERROR: The processor detected an error from the coprocessor. This may be caused by hardware or software.

This list may help you to work out the possible cause of an error.

Chapter 12. Additional Applications and Utilities

OS/2 Warp 4 has a large number of additional applications and utilities. This includes the BonusPak and the Application Sampler CD.

12.1 The BonusPak

The BonusPak is made up of the following applications:

- CompuServe Information Manager
- FaxWorks
- HyperACCESS Lite
- Video IN
- IBM Works and Personal Information Manager
- AskPSP
- Remote Support for OS/2
- Printer Utilities
  - HP JetAdmin
  - HP JetAdmin Port Driver
  - Markvision for OS/2
  - Marknet Port Driver

In this chapter, we will discuss these applications and how to use them.

Remote Support for OS/2

Remote Support for OS/2 will not be discussed in this chapter. You can read about the product in 11.2.1.7, "Remote Support for OS/2" on page 817.

12.2 Installation of the BonusPak

The BonusPak can be installed at the initial install of OS/2 Warp 4 or after the main installation.

The BonusPak is installed during the initial installation. At the OS/2 Setup and Installation panel, select **BonusPak (36.42MB)**. The **More...** is highlighted. By clicking on **More...**, you can go in and select the programs of the BonusPak you want.

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To install the BonusPak after you have installed OS/2 Warp 4, click on **OS/2 System=> System Setup=> Install\Remove=> Selective Install**. When you get the System Configuration panels, select **Next** for both of them. You will then get the OS/2 Setup and Installation panel (same as the one described in the paragraph above, so follow the same process).

Table 8. BonusPak - Default Install Directories

Product	Installs into directory [1]	Disk space required
FaxWorks	*x*:\BONUSPAK\FAXWORKS	1.2 MB
HyperACCESS Lite	*x*:\BONUSPAK\HALITE	0.6 MB
CompuServe Information Manager	*x*:\BONUSPAK\CSERVE	2.7 MB
Video IN	C:\BONUSPAK\VIDEOIN	0.5 MB
IBM Works	*x*:\BONUSPAK\IBMWORKS	14.4 MB
Remote Support for OS/2	*x*:\BONUSPAK\RS231B	1.4 MB
AskPSP	*x*:\BONUSPAK\ASKPSP	4.0 MB

Note:

[1] The drive *x:* can be any drive you wish. However, where the table denotes C:, this means you must install that application on the same drive where OS/2 Warp 4 has been installed. This may or may not be drive C, depending on how you have installed OS/2 Warp 4.

12.3 CompuServe Information Manager

CompuServe Information Manager for OS/2 Warp 4 (CIM for OS/2 Warp 4) is a software product developed by CompuServe that automates communications between your OS/2 Warp 4 system and the CompuServe Information Service.

In Figure 469 on page 831, you can see the CompuServe Information Manager desktop, which is displayed when you open the **CIM for OS/2** object from the Applications folder on your Workplace Shell desktop.

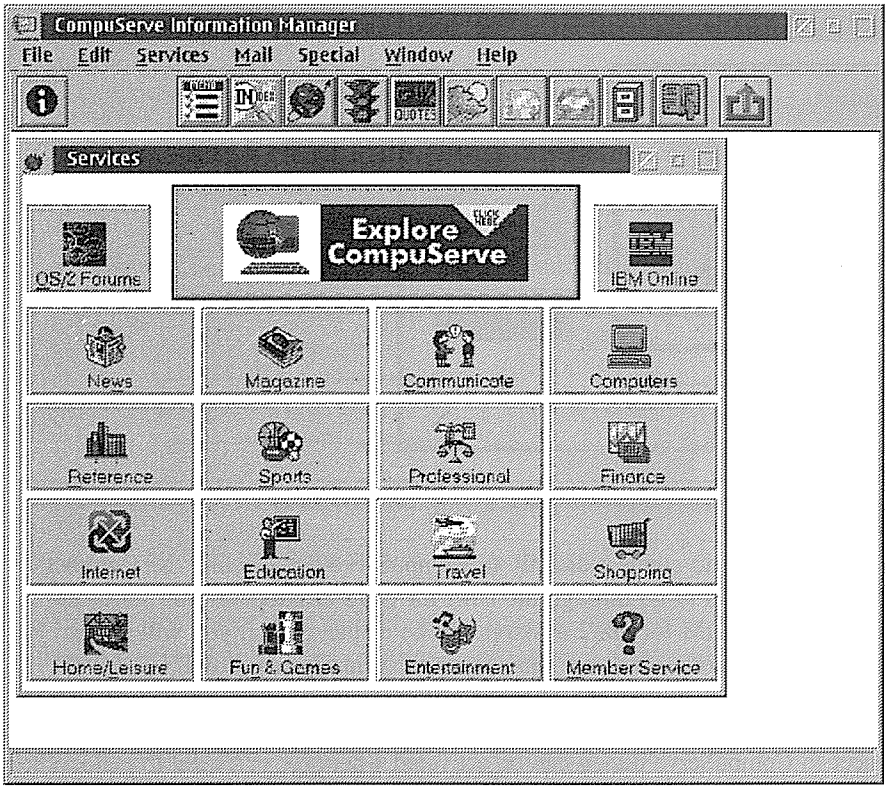

Figure 469. CIM for OS/2 - Initial Desktop

CIM for OS/2 Warp 4 allows new CompuServe members to quickly and easily become acquainted with CompuServe services, and provides existing CompuServe members with easy access to online information and services.

12.3.1 Configuring CompuServe Information Manager

Each time you start CIM for OS/2, the program will display the Connect to CompuServe dialog as shown in Figure 470 on page 832.

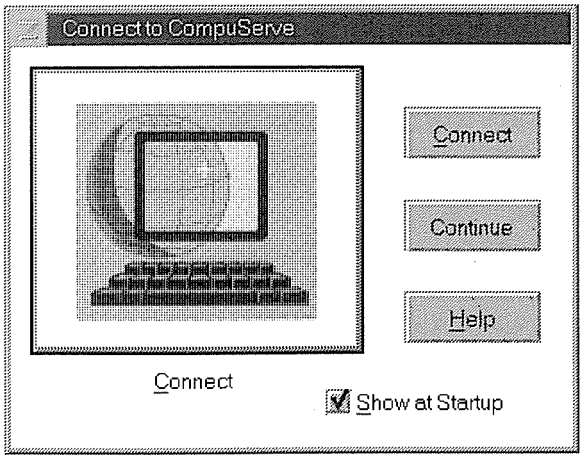

Figure 470. CIM - Connect to CompuServe Dialog

This dialog allows you to connect directly to CompuServe by selecting the **Connect** button, without the need to go through the CIM for OS/2 desktop. If you select the **Continue** option, the CIM for OS/2 desktop will be displayed, but you will not be connected. If you do not wish to see this dialog each time you start CIM for OS/2, you can disable it by deselecting the **Show at Startup** check box.

The Connect to CompuServe dialog can be activated whenever you need to connect to CompuServe, by selecting the **Connect** option from the File pull-down menu on the CIM for OS/2 desktop.

12.3.2 Configuring Your Session Settings

Before you can connect to CompuServe, you must define settings such as the type of connection, the comms port you will use, and any settings specific to your modem. You can define these settings by selecting the Special item on the menu bar in the CompuServe Information Manager window, then selecting **Session Settings...** from the resulting pull-down menu. CIM for OS/2 will display the Setup Session Settings dialog, as shown in Figure 471 on page 833

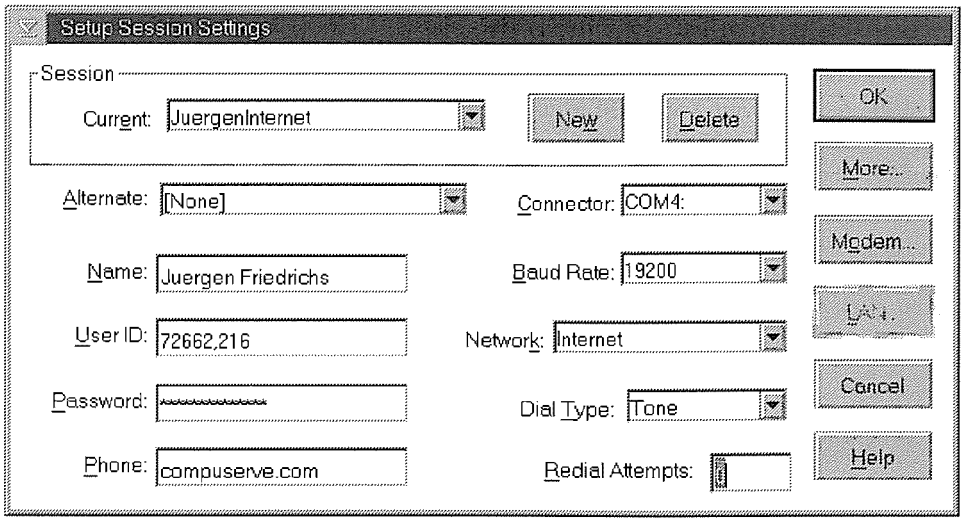

Figure 471. CIM for OS/2 - Setup Session Settings Dialog

Note that if you select the **Connect** option from the Connect to CompuServe dialog without first configuring your connection information, CIM will automatically display this dialog.

The Setup Session Settings dialog shows your current connection information. If you are using CIM for the first time, a set of default settings will be displayed, and you can edit these to suit your own configuration. The Setup Session Settings dialog allows you to create, edit and delete different session configurations for CIM. You can select a session from the Current drop-down list and edit the settings for that session, or create a new session by selecting the **New** button. You can also delete the currently selected configuration by selecting the **Delete** button.

If you wish, you can select an alternate session configuration, which is used if the session configuration you specify is unable to connect you to CompuServe. Use the Alternate drop-down list to specify this alternate configuration.

If you are already a member of CompuServe when you first use CIM, enter your User ID number and password. Note that the password is optional; if you do not enter anything in the Password field, CIM will prompt you for your password when you attempt to connect to CompuServe.

Enter the local CompuServe access telephone number in the Phone entry field. Note that you can specify a different number for each session. This is useful if you travel

frequently, and need to access CompuServe from different locations, since you can set up a different configuration for each location, with the local telephone number.

Enter the correct comms port and transmission speed settings for your modem, and select the network you want CIM to use when connecting to CompuServe from the Network list. Select the dial type you wish to use from the Dial Type list. You should select **Direct** only if your computer is hard-wired to another computer system that provides the connection for you. Note that if you do select **Direct**, there is no need to select a network in the Network list.

If you click on the **Modem** button in the Setup Session Settings dialog, CIM will display the Modem Control Settings dialog, as shown in Figure 472.

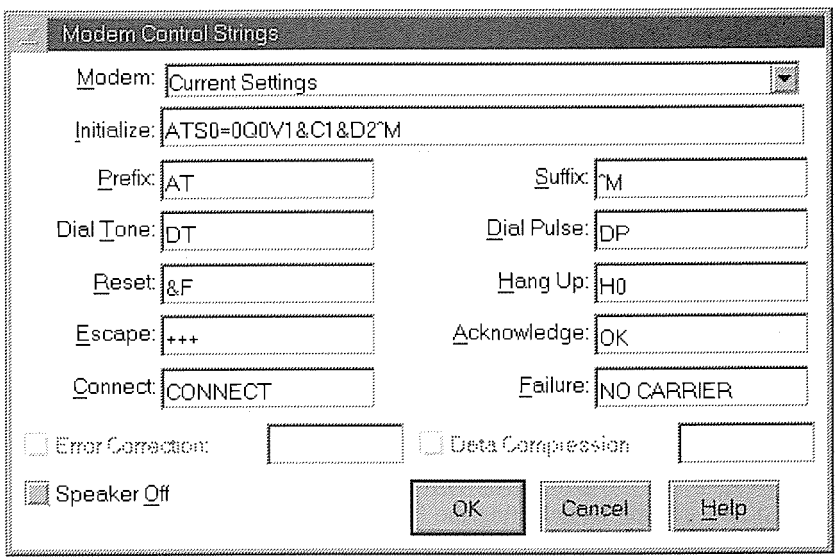

Figure 472. CIM for OS/2 - Modem Control Settings

This dialog allows you to set or modify modem parameters, such as initialization strings, dial tone, etc.

12.3.3 Defining Your Preferences

You can customize CIM to suit your particular needs, by modifying the default preferences that CIM uses when first installed. To make such changes, select the **Preferences...** option from the Special pull-down menu in the CompuServe Information Manager window. CIM will display the Preferences notebook as shown in Figure 473 on page 835.

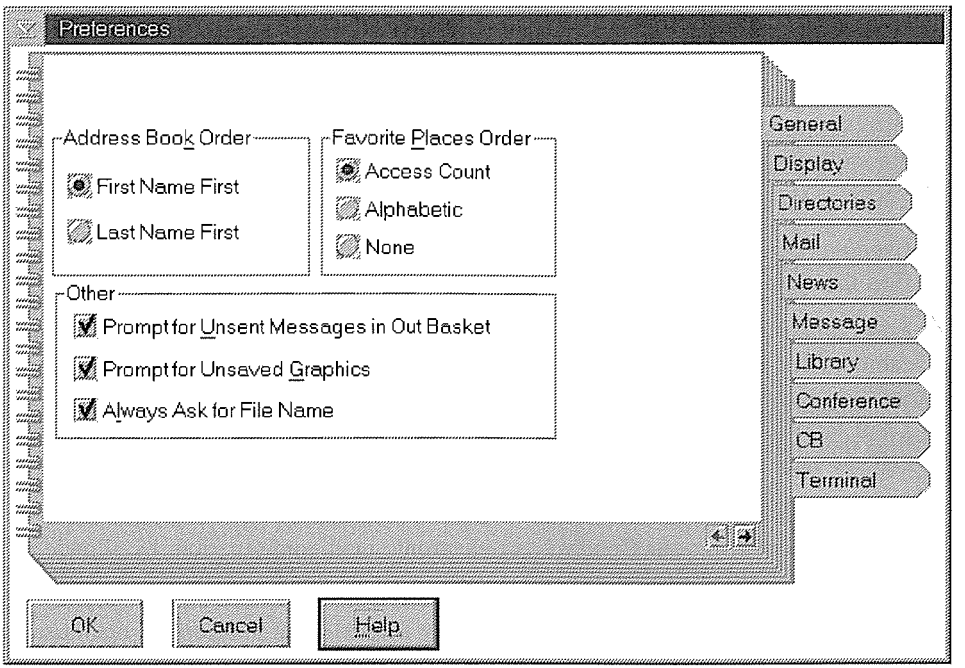

Figure 473. CIM for OS/2 - Preferences Dialog

This notebook contains a number of different pages, allowing you to configure different aspects of the CIM software. The following sections briefly describe each page in the notebook; see the online help text for more detailed information.

12.3.3.1 General

The General page allows you to decide how the entries in your Address Book and Favorite Places windows are listed. You can also specify whether you want to be warned if you attempt to close CIM when you have created messages or graphics but not yet sent them to CompuServe.

12.3.3.2 Display

The preferences on the Display page determine the appearance of the CompuServe Information Manager window. For example, you can select whether you want to browse the Services or Favorite Places windows by default.

12.3.3.3 Directories

The Directory page determines the directories on your hard disk that CIM will use to store various files. From this page, you can modify the following directories:

- *Support Directory* is the directory in which you want CIM to store its support files, such as the Address Book.
- *Script Directory* us the directory where you want CIM to store its script files, which contain commands to automate routine functions such as connection to and disconnection from CompuServe. You should not normally need to change this directory from the existing default. If you decide to change it, be sure that all the ..SCR script files and the MODEMS.DB file are moved to the new directory.
- *Graphics Directory* is the directory in which you want CIM to store the graphics files that you view and save online, such as a GIF weather map.
- *File Cabinet Directory* is the directory in which you want CIM to store its filing cabinet files.
- *Download Directory* is the directory in which you want to store the nongraphics files that you have downloaded from CompuServe.

12.3.3.4 Mail

The Mail page controls your CompuServe electronic mail configuration, by allowing you to select the following options:

- You can have e-mail messages automatically deleted from your online mailbox after you read them or retrieve them to your In-Basket, by selecting **Immediate Delete**. Alternatively, you can delay deletion and specify a number of days for which messages will be held, using the Delay Delete field. You can also preserve your e-mail messages indefinitely by selecting **Keep**.
- You can log all outgoing e-mail messages in a File Cabinet folder, by selecting **Automatically File** and entering a folder name in the Into Folder field.
- You can instruct CIM to Always Retrieve all of the messages from your mailbox when you choose **Get New Mail** from the Mail menu, including any messages for which postage is due. You can also select the **Do not retrieve** option so that CIM will not retrieve any messages from your mailbox for which postage is due, but will save the messages currently in your mailbox. If you prefer that any messages from your mailbox for which postage is due should be deleted, you can select the **Delete without retrieving** option.
- You can use the options in the When to Index File Cabinet box to specify when CIM should index your File Cabinet.

12.3.3.5 News

The News page determines the appearance of your News desktop. From this page, you can choose whether you want CIM for automatically display the Select Folder dialog each time you access the News desktop. You can also specify whether you

want CIM to display the News Toolbox each time, and whether stories should be automatically deleted from your Personal folders after you retrieve them.

12.3.3.6 Message

The Message page enables you to customize your CompuServe forum sessions with respect to your particular interests. You can specify how CIM will display forms, including whether the Forum News Flashes and Forum Toolbox windows should be displayed each time you enter a forum. You can also set logging options, to have CIM automatically save any messages you add to a forum into a folder in your File Cabinet.

12.3.3.7 Library

The Library page enables you to further customize your CompuServe forum sessions with respect to your library interests. For example, you can select the format that CIM will use to display information as you view files in the Forum Library, and whether you want to view graphics files online.

12.3.3.8 Conference

The Conference Preferences let you decide whether:

- Certain conference-related features will be in effect when you participate in a forum conference.
- CIM for OS/2 will monitor particular member activity for you.
- CIM for OS/2 will display invitations sent to you to participate in group conversations or private talks.
- CIM for OS/2 will enable you to create a text file of your room or group conversations.

12.3.3.9 CB

The CB Preferences determine the appearance of your CB Desktop and enable some special CB-related features, such as:

- Monitoring particular CB user activities.
- Displaying invitations sent to you to participate in group conversations or private talks.
- Enabling you to create a text file of your channel or group conversations.

12.3.3.10 Terminal

The Terminal Emulation Preferences allow you to control the size of your Terminal Emulation capture buffer. You can specify the size of the capture buffer by typing the number of lines in the Saved Buffer Lines field (this value should be at list 20).

If you want to access CompuServe through any communications network other that CompuServe's own network, you can check the **Strip High Bit** check box.

12.3.4 Function Keys

If you select the **Set Function Keys...** option from the Special menu, the Function Key Settings dialog will be displayed and you will be allowed to assign a series of keystrokes or commands that you use frequently to up to 10 Alt key combinations.

You should type the sequence of keystrokes you wish to automate in the corresponding Key Definition box. The definition can be up to 80 characters. If you wish, you can also type a label for each Alt key combination in the corresponding Key Label box, so that whenever the key combination is available to you in CIM for OS/2, you will see at the bottom of your panel the label you assigned.

12.3.5 Terminal Emulation

The Terminal Emulation dialog, shown in Figure 474, allows you to initiate a connection to CompuServe or to another host-based computer system using Terminal Emulation.

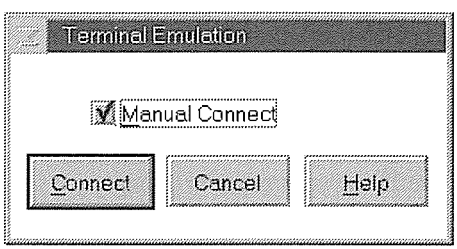

Figure 474. CIM for OS/2 - Terminal Emulation Dialog

To start the communication, you should just select the **Connect** option. If you want to connect to a host-based computer system using the information recorded in your Session Settings, you should make sure that Manual Connect check box is not marked.

12.3.5.1 Capture Buffer

The Terminal Emulation has a Capture Buffer, which automatically saves text displayed on your panel. You can use it to keep an easily reviewable record of everything CompuServe sends to your panel and everything you enter.

You can view and manipulate the contents of your Capture Buffer by selecting the **Terminal Buffer...** option from the Special menu.

12.3.6 Forum Information

If you select the **Forum Database...** option from the Special menu, the Forum Database dialog will be displayed. It lists the forums you have accessed and includes information related to message section names and library names and numbers.

12.3.7 Using CompuServe Information Manager

CIM for OS/2 provides several ways to access the services on CompuServe. You can manage these different ways of access either from the Commands Menu or from the Initial Desktop Ribbon.

12.3.8 Browsing Services

The Services window is a pictorial menu of the major service categories on CompuServe. It allows you to access, just by clicking the left mouse button on the corresponding box, to the following categories of services:

1. OS/2 Forums
2. IBM Online
3. News
4. Magazine
5. Communicate
6. Computers
7. Reference
8. Sports
9. Professional
10. Finance
11. Internet
12. Education
13. Travel
14. Shopping
15. Home/Leisure
16. Fun and Games
17. Entertainment
18. Member Service

You can see the graphical interface provided by this window in Figure 469 on page 831.

By default, the Services window is displayed when the Initial Desktop is loaded, but you can disable it by checking out the **Browse** option from the Display page of the Preferences notebook, as explained in 12.3.3, "Defining Your Preferences" on page 834. You can also activate this menu either by clicking on the appropriate icon on the Ribbon, or by selecting the **Browse...** option from the Services menu.

12.3.9 Grouping Your Favorite Services

The Favorite Places dialog, shown in Figure 475, maintains a customized list of your favorite services so that you can access them easily and quickly.

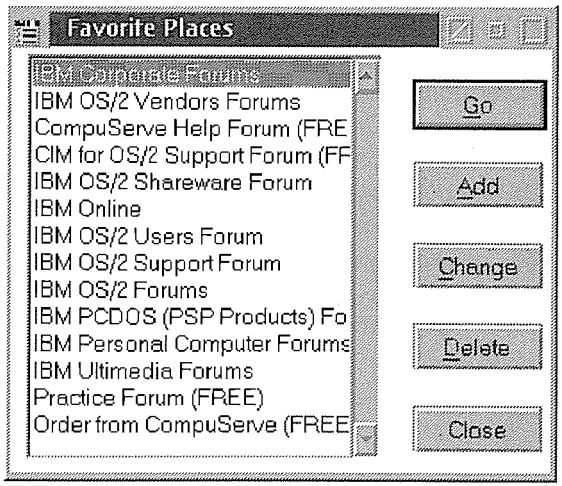

Figure 475. CIM - Favorite Places

If you check the **Favorite Places** option in the Display page from the Preferences notebook, the Favorite Places dialog will be displayed each time you start CIM for OS/2. You can also access this dialog by choosing the **Favorite Places** option from the Services menu, or by selecting the **Favorite Places** icon on the Ribbon.

12.3.9.1 Managing Your Favorite Places

Your Favorite Places entries are listed in alphabetical order. To go directly to a service or forum listed in your Favorite Places, you should highlight the service and select **Go**.

You can also add, modify or delete an entry in your Favorite Places, by selecting the **Add**, **Change** or **Delete** buttons, respectively. To save your changes and close the dialog, you have to select **Close**.

12.3.10 Finding Services and Going Directly to Them

12.3.10.1 Searching Services

CIM for OS/2 lets you look for specific services by introducing, into the Find dialog shown below, a topic that describes the type of service you are interested in.

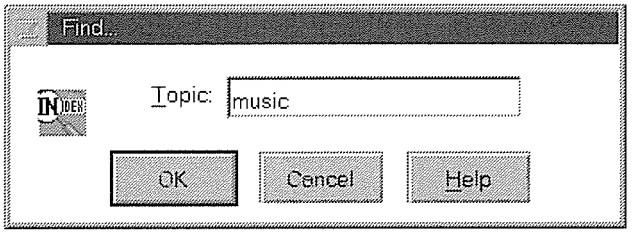

Figure 476. CIM for OS/2 - Find... Dialog

You can get the Find dialog by choosing the **Find...** option from the Services menu or by selecting the **Find** icon on the Ribbon.

If you are not already connected, CIM for OS/2 will establish the connection for you, and then the following Search Results dialog will be displayed:

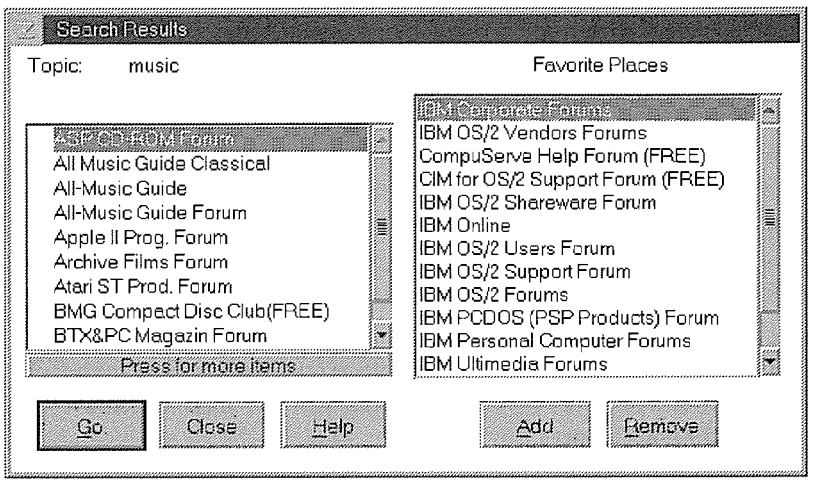

Figure 477. CIM for OS/2 - Search Results Dialog

This dialog allows you to access any listed service directly, and you can even add the desired services to your Favorite Places.

12.3.10.2 Going Directly to a Service

CIM for OS/2 allows you to access directly a specific service from the Go... dialog shown in Figure 478 on page 842.

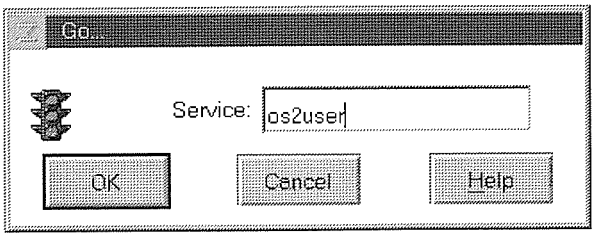

Figure 478. CIM - Go... Dialog

You can get to this dialog by choosing the **Go** option from the Services menu or by selecting the **Go** icon on the Ribbon. Then, to go to the desired service, you should type the unique service name (which must be known in advance).

What If You Don't Know the Unique Service Name?

You can type `QUICK` in the Service field in order to view a list of service names for all CompuServe services and forums.

12.3.11 Other Services

CIM for OS/2 allows you to access many other CompuServe services from the options provided by the Services menu. Most of them also have their corresponding icon on the Ribbon.

A short description of each of these services follows:

Executive News The Executive News Service (unique service name: ENS) puts you in touch with the latest news. You can read news stories from Public and Personal Folders, and mark any you wish to retrieve to your Filing Cabinet.

CB Simulator CompuServe's CB Simulator lets you communicate with people all over the world. You can monitor and tune to channels to converse with other CBers. Your comments are visible to others on the channel, and their comments are visible to you. This is a surcharged service.

Just for New CBers

If you are new to CB and need online assistance, you should select **Access General Chat** and then tune to Channel 2.

What's News This option displays news announcements.

Special Events This option allows you to access special events announcements.

Weather... This option displays the Weather dialog, shown in Figure 479, which offers weather forecasts for selected cities across the United States and the world.

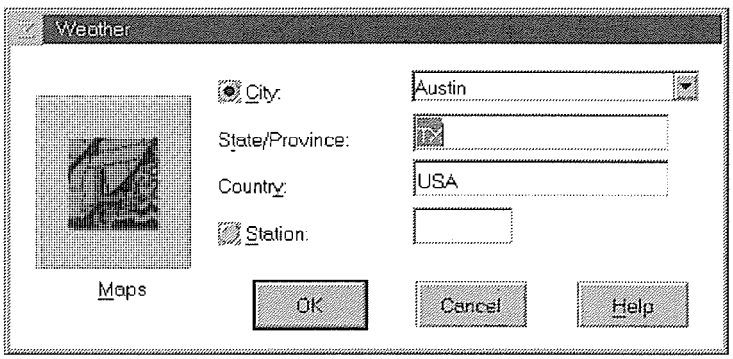

Figure 479. CIM for OS/2 - Weather Forecast Service

Quotes... The Stock Quotes dialog brings you the latest stock market quotes from a list of ticker symbols that you define.

Portfolio... The Stock Portfolio dialog enables you to create and maintain a record of your stock purchases and produce a report analyzing their market performance.

12.3.12 Sending and Receiving Mail

The CompuServe Mail provided by CIM for OS/2 enables you to communicate with other members, as well as with users of other services such as MCI Mail, AT&T Mail and the Internet.

12.3.13 The Address Book

CIM for OS/2 provides an Address Book, shown in Figure 480 on page 844, to store the names and addresses of your electronic correspondents.

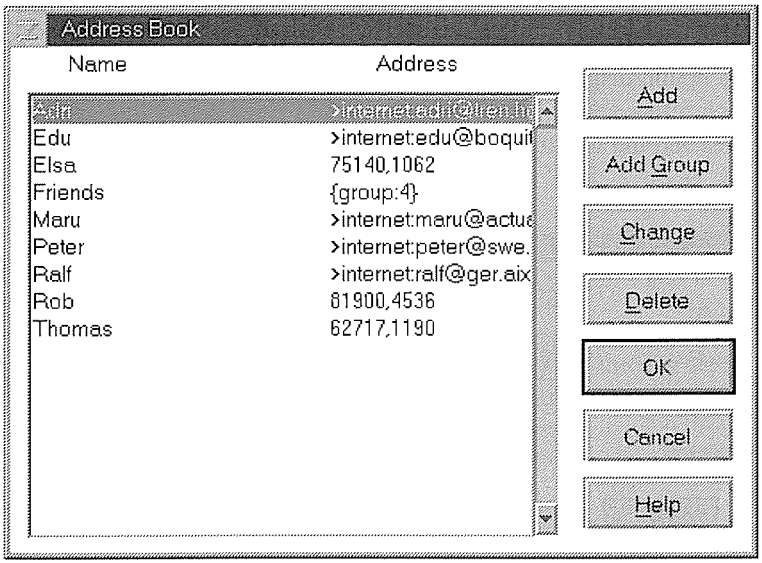

Figure 480. CIM for OS/2 - Address Book

You can access it from the Ribbon or by choosing the **Address Book...** option from the Mail menu. There are also many dialogs in different CIM for OS/2 menus that provide options to access the Address Book.

The Address Book entries are listed in alphabetical order. You are allowed to add, change or delete an individual entry, and you can also manage groups of entries.

Electronic Address Formats

You can obtain information about the Electronic Address Formats supported by the Address Book from the online help provided by CIM for OS/2.

12.3.14 The File Cabinet

CIM for OS/2 provides a File Cabinet, shown in Figure 481 on page 845, where you can store your electronic messages and articles.

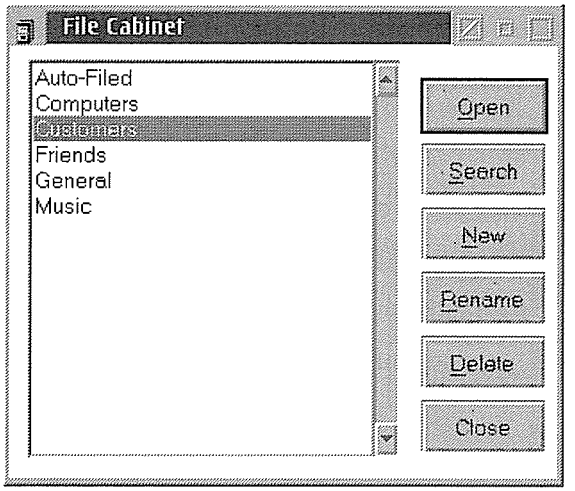

Figure 481. CIM for OS/2 - File Cabinet

You can access it by selecting the **File Cabinet...** option from the **Mail** menu or by clicking on the corresponding icon from the Ribbon. There are also many dialogs in different menus that provide options to access the File Cabinet.

The messages and articles are organized in folders, which are listed alphabetically. You can open a folder to see its contents, add a new one, rename a folder or delete it.

CIM for OS/2 allows you to search for filed documents in your File Cabinet. You can do it either by selecting the **Search** button from the File Cabinet dialog, or directly from the Mail menu by choosing the **Search File Cabinet...** option.

You are also allowed to manage your messages from the In-Basket and Out-Basket dialogs, which can be accessed by selecting the **In-Basket...** and **Out-Basket...** options, respectively, from the Mail menu. While the former lists the incoming Mail entries that you have retrieved from your CompuServe mailbox, the latter lists your outgoing CompuServe Mail messages, which are automatically removed from the Out-Basket when you send them.

12.3.15 Sending Mail

If you select the **Create Mail...** option from the Mail menu, the Recipient List dialog, shown in Figure 482 on page 846, will be displayed.

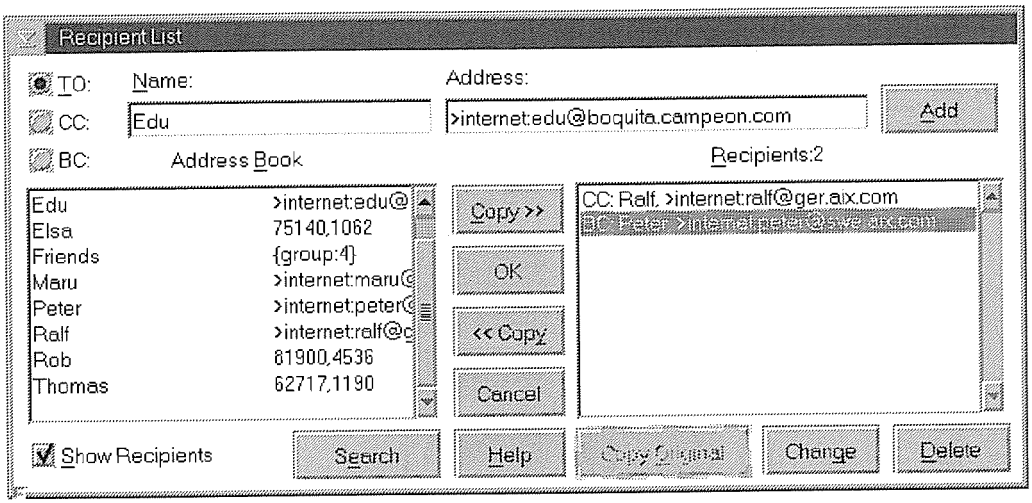

Figure 482. CIM for OS/2 - Recipient List Dialog

This dialog allows you to assign recipient information to a CompuServe Mail message that you are creating. You have to specify at least one primary recipient, by selecting the **TO** option. You can also identify carbon copy recipients (those who will receive a copy of your message) by selecting the **CC** option, and blind copy recipients (those that will also receive a copy of your message but are not mentioned in any corresponding distribution list) by selecting the **BC** option.

If you want your TO and CC recipients to be listed in your message, you should check the **Show Recipients** check box.

If the recipient is already an entry in your Address Book, you can click on the **Copy >>** button to add it to your Recipient List.

If the recipient is not listed in your Address Book but is listed in the CompuServe Membership Directory, you can select **Search** to visualize the Search Member Directory dialog where you can search the CompuServe Membership Directory for member addresses and add them directly to the Recipient List.

You can also type the recipient's name and electronic mailing address, and record this information under Recipients by selecting the **Add** button.

You are always allowed to change or delete the inserted data, and interchange information between the Address Book and the Recipient List.

If you are replying to a message and want the reply to be sent to each original message recipient, you should click on the **Copy Original** option (which will be a valid selection only if you are actually replying to a message).

After having completed the Recipient List dialog information, when you click **OK** you are prompted to the Create Mail dialog, shown in Figure 483.

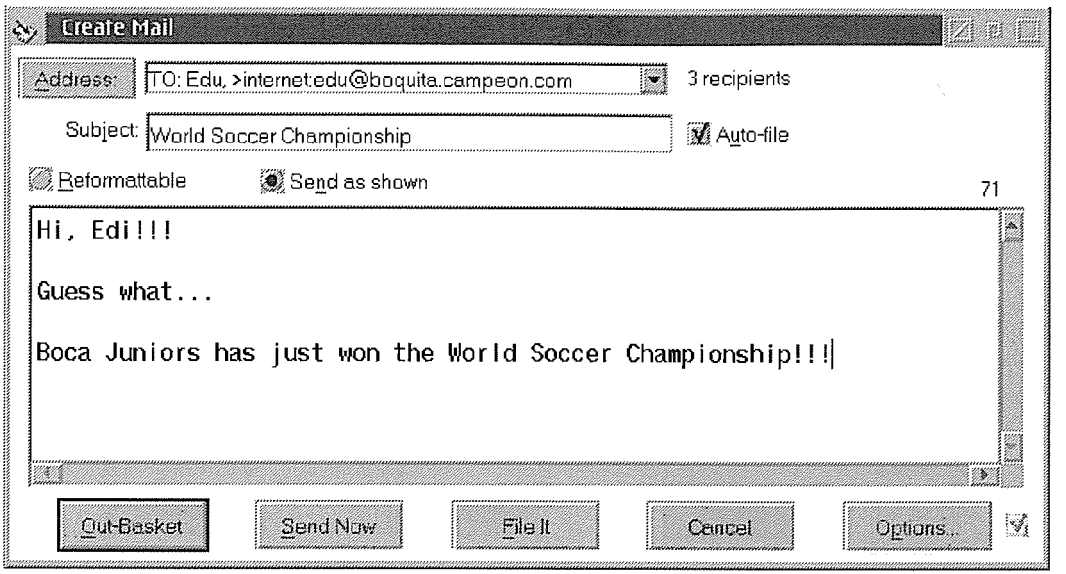

Figure 483. CIM for OS/2 - Create Mail Dialog

In this dialog you should insert the subject of the message and the content (up to 50,000 characters). You can also assign additional options to your message by selecting the **Options** button. If you modify any of the default options in the Message Options dialog, CIM for OS/2 will mark the check box beside the **Options** button.

You can also copy the message to your Out-Basket by clicking the **Out-Basket** button, transmit it by selecting the **Send Now** button, or copy it to your File Cabinet by clicking the **File It** button. Unless you specify information for address, subject and the body of your message, these three options will not be available.

To have CIM for OS/2 wrap the message text to the recipient's specified panel width, you should check **Reformattable**. Otherwise, it will preserve the text format of your message when it is sent. And you should also check the **Auto-file** check box if you

want CIM for OS/2 to automatically file a copy of your message in your File Cabinet when you send it.

12.3.15.1 Sending a File

CIM for OS/2 allows you to send a text or binary file that is stored on disk as a CompuServe Mail message, by clicking on **Send File** in the Mail menu.

When you select this option, the Recipient List dialog will be displayed. You have to complete the required information, as described in 12.3.12, "Sending and Receiving Mail" on page 843, and then the following Send File Message dialog will be displayed.

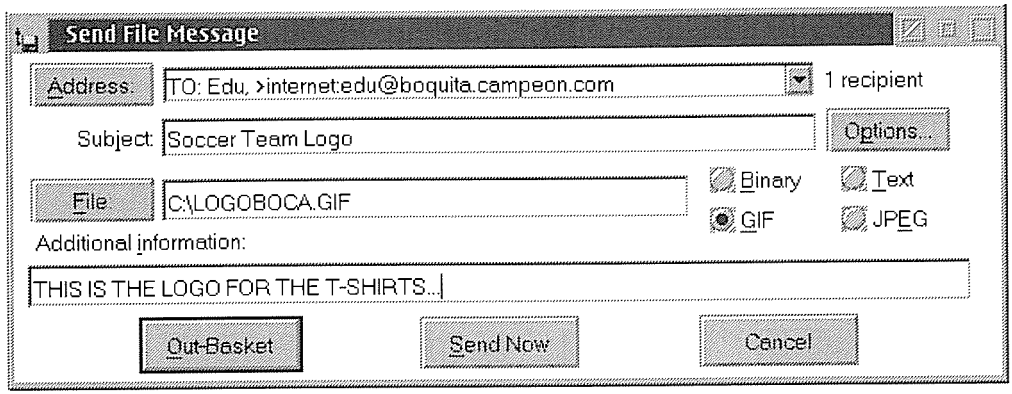

Figure 484. CIM for OS/2 - Send File Message Dialog

In this dialog you are asked to complete the recipient Address information, the Subject of the message, and the name and type of the File to be sent. You can also type a comment in the Additional Information field, which will be seen by the recipient before retrieving your file message.

12.3.16 Receiving Mail

CIM for OS/2 provides many options from the Mail menu that allow you to manage the received mail.

The Get New Mail dialog, which can be accessed either by choosing **Get New Mail** from the Mail menu or by selecting the corresponding icon on the Ribbon, lists your waiting mail messages in your CompuServe mailbox.

From this dialog you can access to the following options:

Get This option displays the Message dialog, shown in Figure 485 on page 850, which allows you to view a message and perform the following operations on it:

- Save an address from the Recipient List into your Address Book.
- Save the sender's name and electronic mailing address in your Address Book.
- Let the sender receive a confirmation message stating that you have read the message.
- Reply to the received message.
- Establish the message as high priority so that it precedes nonpriority messages in your CompuServe mailbox.
- Put a copy of the message into your In-Basket.
- Copy the message to your File Cabinet.
- Forward the message to one or more recipients.
- Remove the message from your mailbox.

Get All Moves all messages in your mailbox to your In-Basket.

Delete Removes a message entry from your mailbox.

Undelete Restores messages that have been deleted.

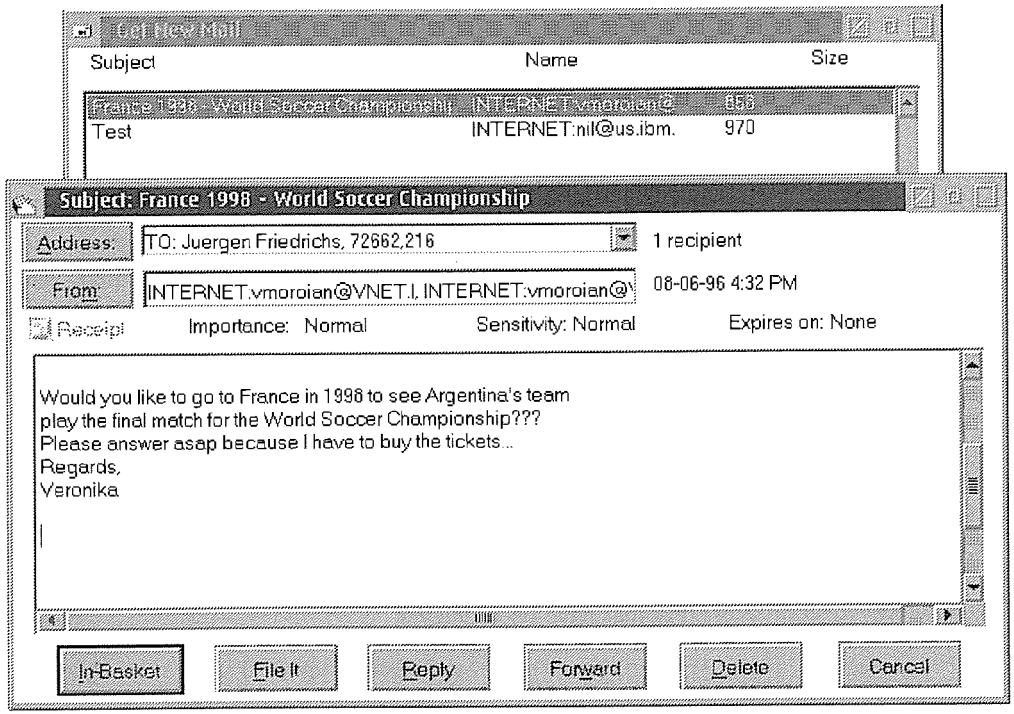

Figure 485. CIM for OS/2 - Message Dialog

The Search New Mail dialog, which can be accessed by selecting **Search New Mail** in the Mail menu, is another alternative for managing received mail. It allows you to find mail messages in your mailbox that meet your search criteria. You can search by sender, subject, sensitivity, priority and date.

12.3.17 Sending and Receiving Mail Automatically

CIM for OS/2 allows you to automate your sending and receiving of Mail by clicking on the **Send/Receive All Mail** option in the Mail menu.

If you want CIM for OS/2 to disconnect from CompuServe after sending and retrieving all the messages, you should check the **Disconnect when Done** option, as shown in Figure 486 on page 851

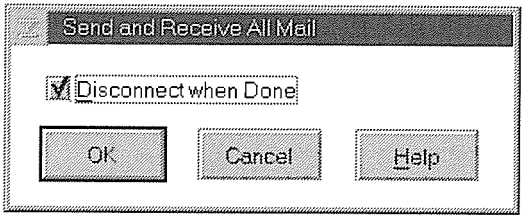

Figure 486. CIM for OS/2 - Send and Receive All Mail Dialog

12.3.18 Viewing Forums

Forums are places where CompuServe members can meet others who share their special interests. Forum members can exchange information, expound opinions and ideas, and participate in general conversations.

To view a list of forums related to a topic that interests you, you can choose the **Find** option from the Services menu and search for the specific topic. You can also search for FORUMS to view a comprehensive list of all the CompuServe forums.

Every forum has a message board, data libraries and conference rooms.

12.3.19 Message Board

Forum messages are wide-ranging correspondence that can be read by everybody. You can browse the various forum message sections to explore and read the related message topics, or you can go straight to any messages addressed to you.

Messages are not kept forever in a forum. Some very busy forums keep messages for only a few days. An important message might be placed in one of the forum's libraries for longer availability.

12.3.19.1 Creating a Forum Message

The Create Forum Message dialog, shown in Figure 487 on page 852, allows you to compose a message that you can post in a forum message section.

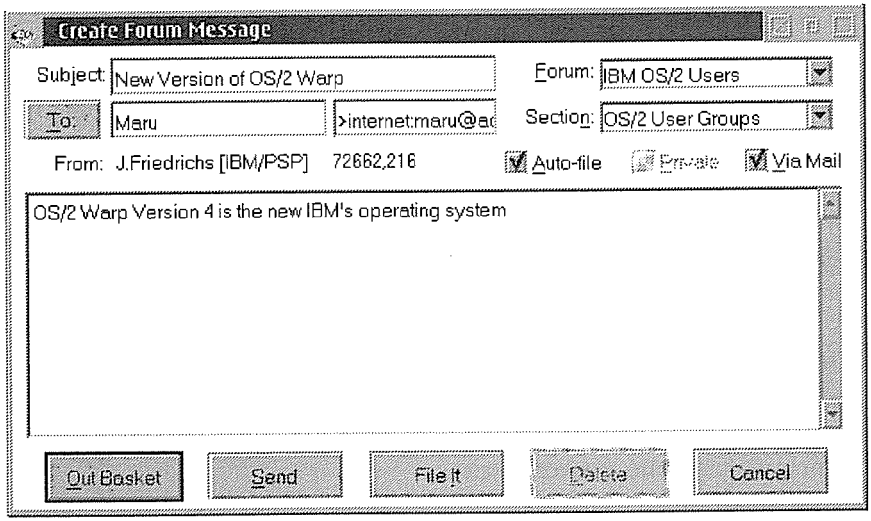

Figure 487. CIM for OS/2 - Create Forum Message Dialog

You can access this dialog by selecting the **Create Forum Message** option from the Mail menu.

In this dialog you are asked to complete information related to the subject that describes your message, the person to whom you are sending the message, the forum message section and the forum name in which you want your message to be posted, and the content of it. You can also specify if you want your message to be visible only to the recipient and if you want to send it via CompuServe Mail to the recipient's CompuServe mailbox rather that post it on the forum's message board.

Finally, if you select the **Send** option the message will be sent to the specified recipient.

12.3.20 Searching for CompuServe Members

The Search Member Directory dialog, shown in Figure 488 on page 853, searches the CompuServe Member Directory for information about members.

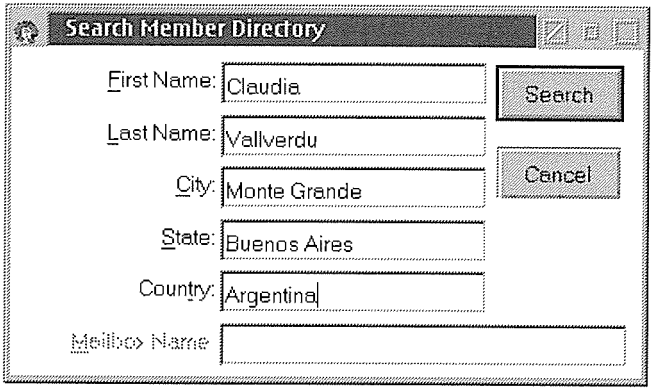

Figure 488. CIM for OS/2 - Search Member Directory Dialog

You can access this dialog by choosing the **Member Directory...** option from the Mail menu, or by selecting the **Search** button in the Recipients List dialog.

An Offline Reader for CIM for OS/2

There is an undocumented and unsupported navigational tool called Auto-Pilot, which can automate common CompuServe tasks and therefore save connect-time charges.

You can obtain it free by downloading the latest XTRCIM.ZIP file from the CompuServe's OS2USER Forum (search for the keyword Auto-Pilot).

12.4 FaxWorks for OS/2

FaxWorks for OS/2 is a graphical 32-bit fax application developed by Keller Group. FaxWorks for OS/2 allows you to create, edit, send and receive fax documents using your computer and fax hardware, such as a fax modem.

OS/2 Warp 4 includes FaxWorks for OS/2, shown in Figure 489 on page 854.

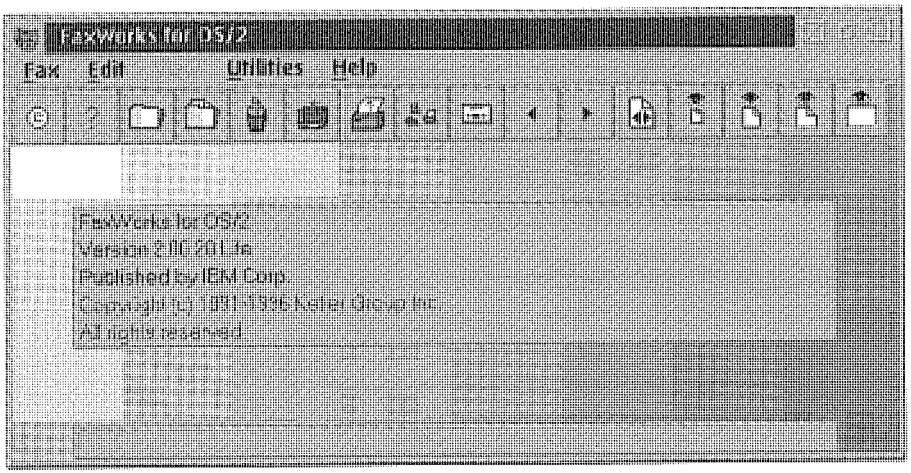

Figure 489. FaxWorks for OS/2

It is an entry version of the full-featured FaxWorks, which provides the following functions:

- Send and receive faxes using the OS/2 FaxWorks device driver
- Send and receive DOS and Windows faxes
- True object-oriented drag-and-drop faxing
- Phone Book
- Fax logging
- Fax printing
- Normal and fine resolution
- Resend capabilities
- Fax tool bar
- Phone answering

Using FaxWorks you get a "paperless" solution for dealing with fax documents on your OS/2 Warp 4 system. You can send faxes directly from your computer without needing to print them first, or incurring the additional cost of a fax machine. You can also receive faxes from other people and store them on your OS/2 Warp 4 system.

FaxWorks allows you to create and send a fax from within any application. Your fax modem appears to the application as though it were a printer attached to your system. When you "print" a file or document from the application, the data is sent to FaxWorks, and a fax is created and sent.

This section describes the main features of FaxWorks for OS/2. For full information on the use of FaxWorks, read the online help for the FaxWorks application.

Online Help

The online information provided by FaxWorks for OS/2 is the complete documentation for the full product, so you may find some features that are not supported by your entry version.

12.4.1 Configuring FaxWorks

The FaxWorks icon is found by clicking on **Programs=> Utilities**. The first time you start FaxWorks after installing OS/2 Warp 4, the Properties notebook is displayed, as shown in Figure 490.

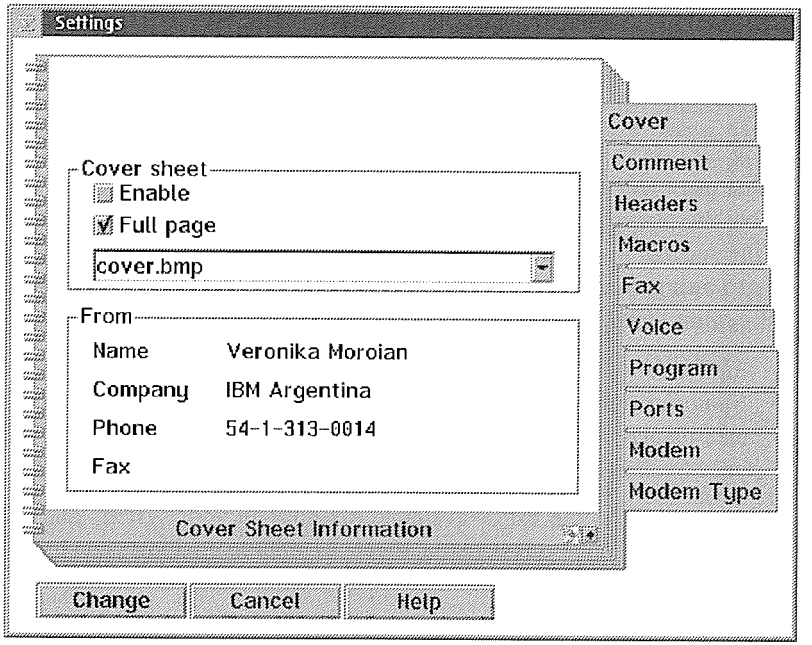

Figure 490. FaxWorks for OS/2 - Properties Notebook

In this notebook, you need to configure the following information:

Cover Default information that will appear in the Fax Send dialog box when you send a fax document. You can select whether a cover sheet should be added to your fax documents when you send them, the

bitmap for use as your default cover sheet, and the default text information for it, such as name, company, phone and fax numbers.

Comment On this page you can select the cover sheet font as well as include free format text in the cover sheet.

Headers You can specify whether a page header line will be added to the top of your fax pages when they are transmitted, define the prefix text for this header and enable a second header with your fax recipient's name and company.

Macros On this page, you can assign abbreviated names to complex dialing sequences, such as long-distance access codes or calling card numbers.

Fax You can specify the fax settings such as the "Notes" value that will be placed in the log record when you send a fax, the dial prefix to be used, the fax local ID, the number of attempts that will be made to successfully complete a fax transmission and the time to wait between attempts.

Voice This page is used to enable and control the optional voice features in the program, which can be used only if you have supported fax/voice hardware.

Program In this page you can identify the type of monitor you are using and enable the playing of brief tone sequences to provide audio feedback on the success or failure of send and receive operations. You can also select sorting and display of names in the Phone Book, based on the last or first name, and choose the date display format:

- *Alpha:* (dd-mmm-yy) For example, 08-JUL-71.
- *Numeric:* (mm-dd-yy) When you choose this option, the exact date display format is determined by the Country object within your System Setup folder.

Ports This page displays the list of available fax ports in your system, and allows you to change the status of a port by double-clicking your left mouse button on it.

Modem This is where you set options for your fax hardware, such as the maximum baud rate that it supports. You can also establish that the fax modem is used in a "private" mode (for example, fax software acquires the fax modem for its exclusive use when sending or waiting for incoming calls) or that the fax software uses the COM ports for accessing the fax modem rather than using its own fax modem device driver (this is needed if you have an intelligent serial port card which

uses special COM device drivers). You also have options to select the fax hardware speaker mode, the line type and the number of rings that should be allowed before answering an incoming call when in receive mode.

Modem Type In this page you can specify the command set that is required for your fax modem. You are asked to choose one of the four different fax protocols supported by FaxWorks:

- *SendFax*
- *Class 1*
- *Class 2*
- *Class 2.0*

These protocols determine how fax information is transmitted and received through the telephone system. Different countries prefer different protocols, and different types of fax modems use different protocols by default.

README.DOC

Before starting FaxWorks for the first time, you should take a look at the README.DOC file. It contains important information on configuring FaxWorks for use with specific types of fax modems.

After completing this first configuration, you can change any FaxWorks settings by opening the Properties notebook. You can always access the notebook by selecting the **Settings** option from the Utilities menu in the FaxWorks window.

12.4.2 Sending Faxes

When FaxWorks is installed, an icon called FxPrint appears when you click on **Connections=> Printers**. This is a fax machine object, and has a device driver similar to a printer device driver. In fact, the FxPrint driver works identically to a normal printer driver, but instead of sending data to a printer, it sends it to your fax modem.

FaxWorks generates a cover sheet for each fax that you send. The information on this cover sheet includes the recipient's name and address, and you can enter it manually at the time you send the fax, or have FaxWorks generate it for you from the information contained in your Phone Book entries (see 12.4.6, "The Phone Book" on page 861 for further information).

FaxWorks and the FxPrint driver allow you to send faxes in one of two ways:

1. "Printing" to FaxWorks directly from within an application.
2. Dragging and dropping a document object onto the FxPrint object.

12.4.3 Faxing from an Application

To send a fax from within an application, you simply need to tell the application to send the print data to FxPrint.

Most applications have a dialog or pop-up menu that allows you to specify printer setup options and print destinations. After having installed FaxWorks, one of the options in these printer configuration dialogs will be FxPrint. So, if you select this option, you will be ready to send your print job to FaxWorks simply by printing the file or document.

Faxing from a Windows Application

Because of some limitations in the way that Windows applications under OS/2 Warp 4 talk to printer drivers, you need to do some additional setup to send faxes from a Windows application.

If you want to fax from Windows applications, you should do it via a Windows IBM Proprinter X24 printer driver. FaxWorks will trap and route the data to your fax modem.

To install this printer driver, you can perform the following steps:

1. Open a WIN-OS/2 session from within the Command Prompts folder.
2. Open the **Main** program group and then open the **Control Panel**.
   a. Select **Printers**.
   b. Select **Add** to add the IBM Proprinter and then click **Install**.
   c. Click **Connect** and connect the printer driver to the same port as the OS/2 FaxWorks driver (for example, LPT3).
3. Close the Control Panel and exit from the WIN-OS/2 session.

Now, whenever you select **IBM Proprinter** as the desired printer in your Windows application, the print job will be routed to FaxWorks.

If you also install the Adobe Type Manager (ATM) fonts for Windows, a greater range of font options will be available when faxing from a Windows application.

12.4.4 Using Drag and Drop Techniques

Many OS/2 applications allow you to print files and documents simply by dragging their icons and dropping them on a printer object.

Since the FaxWorks FxPrint driver works in exactly the same way as a printer object, you can also send faxes by dragging the object for the file you wish to send, and dropping it over the FxPrint object on your desktop.

Printing documents and sending faxes using drag and drop is normally limited to text files and files created using native OS/2 applications. For example, if you try to use drag and drop to print or fax a document created using MS Word for Windows, the document will not be formatted properly, since there is no way for OS/2 Warp 4 to tell Word for Windows that it needs to intervene and format the document for the printer or fax. Only native OS/2 applications have this ability. So, if you wish to fax a document created using a DOS or Windows application, you should do it from within the application, as described in 12.4.3, "Faxing from an Application" on page 858.

12.4.5 Send Fax Dialog

When you send a fax, either from within an application or using drag and drop, FaxWorks will display the Send Fax dialog, as shown in Figure 491 on page 860.

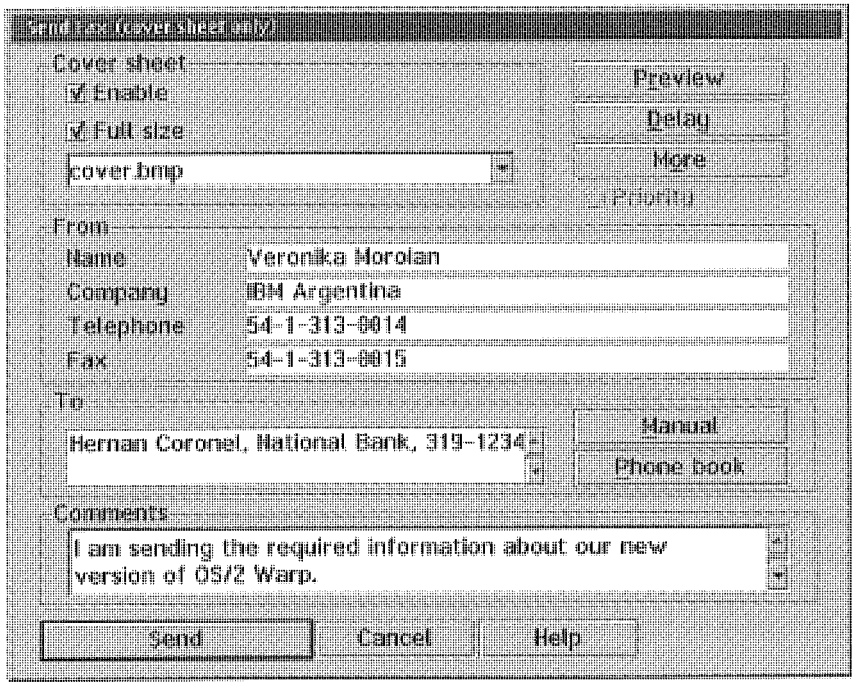

Figure 491. FaxWorks for OS/2 - Send Fax Dialog

The default values for the check boxes and the field on this panel are set in the Settings notebook. However, you can change them as necessary.

You can configure the following information from this panel:

Cover Sheet This check box specifies whether or not a cover sheet should be added to your fax document. You can enable the cover sheet, choose if you want it to be the same size as the first page of your fax document and even select the bitmap to be used.

From The From fields allow you to specify text information related to the sender of the fax.

To You can specify the destinations for the fax by clicking on either the **Manual** or **Phone Book** buttons. The former will allow you to manually enter the fax number to which you want to send your document. For further information about the latter, see 12.4.6, "The Phone Book" on page 861.

You can select as many destinations as you like, and all of them will be listed in the To field.

Comments In this field you can include free format text for the cover sheet.

12.4.6 The Phone Book

The Phone Book provides an easier and quicker way for you to specify the recipient (or multiple recipients) for your faxes.

The default Phone Book provided by FaxWorks is shown in Figure 492.

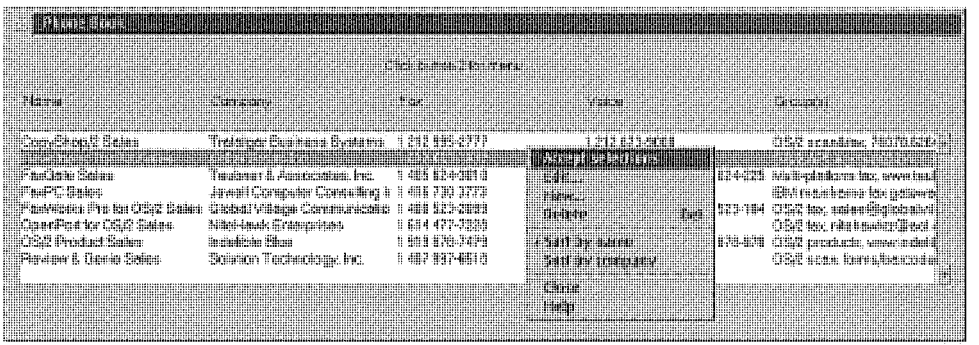

Figure 492. FaxWorks for OS/2 - Phone Book

12.4.6.1 Selecting Recipients

To select a recipient for a fax, simply double-click your left mouse button on the desired Phone Book entry. It will be automatically added to the To field of the Send Fax dialog.

You can choose one recipient or select multiple recipients. In the latter case, the document will be faxed to each of the specified recipients in turn.

Note that the information in the Name and Company fields in each selected Phone Book entry is used on the cover sheet when you send the fax. Therefore, each recipient receives a personally addressed cover sheet even when sending the fax document to multiple recipients.

12.4.6.2 Managing Phone Book Entries

You can add, edit and delete entries in order to customize the Phone Book according to your needs. You are also allowed to sort the entries.

To manage Phone Book entries, click your right mouse button on the Phone Book window to display its context menu. The options provided by this menu allow you to:

- Accept selections by adding them to the To field of the Send Fax dialog.
- Edit a particular entry.
- Create a new entry.
- Delete the desired entry.
- Sort by name all the entries in the Phone Book.
- Sort by company all the entries in the Phone Book.

12.4.7 Receiving Faxes

FaxWorks allows you to decide whether or not your fax hardware should answer incoming calls and receive fax transmissions. By default, the receive mode is turned off. This is because when you turn on the receive mode, FaxWorks takes control of the communication port and modem, and no other application is allowed to access it. For example, having FaxWorks monitoring your modem and phone connection would prevent you from dialing a bulletin board system, accessing the Internet or doing anything else that requires the use of the modem.

You can activate the receive mode by selecting the **Receive** option from the Fax menu, and then choosing one of the different available receive modes:

Current call Immediately starts receiving.

This option should be used if you manually answer a call with an attached telephone, then realize that a fax machine is calling you, or if someone manually dials from their fax machine and is now ready to send you a fax document on the same call.

One call Tells FaxWorks to answer the next incoming call, receive one fax document and then turn off receive mode.

You should select this option if you normally use your phone line as a voice line, but you know that the next call will be a fax.

All calls Tells FaxWorks to answer all incoming calls as fax calls.

This mode should be used only if you have a dedicated line for your fax activity.

12.4.8 Phone Answering

FaxWorks in OS/2 Warp 4 supports telephone answering. When in receive mode, the program will answer incoming calls by playing an Answer script. The Answer script can be changed or customized (in the full retail product only). If you are running the default script (or using the Lite version of the product), then the program will do the following when it answers an incoming call:

- A recorded message will be played to the caller.
- If your fax/voice hardware detects that the caller is a fax device, it will switch to fax mode and receive the fax.
- Otherwise, it will record a message from the caller and place the message in your log.

12.4.9 Editing Faxes

When a fax is received, it is displayed in the FaxWorks window. You can read it, underline key words with your "pen," make notes to point to an interesting section, add an attachment or a comment in the margin, and then file the modified document for future reference.

FaxWorks supports OS/2 fonts for text operations, so that you can type directly on the fax to add your annotations or comments. You can also drag and drop a bitmap or image file onto the fax page, or paste text by dragging and dropping a text file onto the fax page.

If you wish, you can then fax the modified document to someone else by using the **Send** option on the FaxWorks tool bar, or print it by using the **Print** option on the tool bar.

12.4.10 The Fax Log

Whenever you send or receive a fax, you can store a copy of it in your Fax Log. To open the Fax Log you can either use the button provided by the FaxWorks tool bar, or select the **Open Log** option from the **Fax** menu.

If you send and receive many faxes, your log will grow quite large and may contain copies of faxes that you no longer want to keep. FaxWorks allows you to remove the unwanted entries and free up space on your hard disk.

Each entry in the log has its associated context menu that can be activated by clicking your right mouse button on it. This menu provides options that allow you to open, print, resend or delete the fax, or even edit its corresponding log entry.

12.4.11 Upgrading to FaxWorks Pro

The FaxWorks Pro application that comes with OS/2 Warp 4 is FaxWorks Pro for OS/2. This entry version is intended primarily for home and casual use, and has some restrictions.

If you wish to use FaxWorks Pro in a business environment or if you simply want to use more advanced features not included in FaxWorks for OS/2, you can upgrade to the full-featured FaxWorks Pro product.

FaxWorks Pro allows the use of multiple Phone Books as well as the use of distribution lists and broadcasting. It also gives you a variety of editing features, which include the ability to drop bitmaps or copies of received faxes into the fax document. You can, for example, use this method to sign your document with a bitmap image of your signature.

You can find more information on upgrading to FaxWorks Pro product from the online help provided in FaxWorks.

12.5 HyperACCESS Lite

HyperACCESS Lite, found by clicking on **Programs=> Utilities**, is an object-oriented terminal emulation program that makes it easier to communicate with other computer systems over standard telephone lines using modem-to-modem connection. In fact, it is an entry level version of the full-featured HyperACCESS product, specially designed by Hilgraeve Inc. for inclusion in OS/2 Warp 4.

You can see the HyperACCESS Lite for OS/2 main window in Figure 493 on page 865.

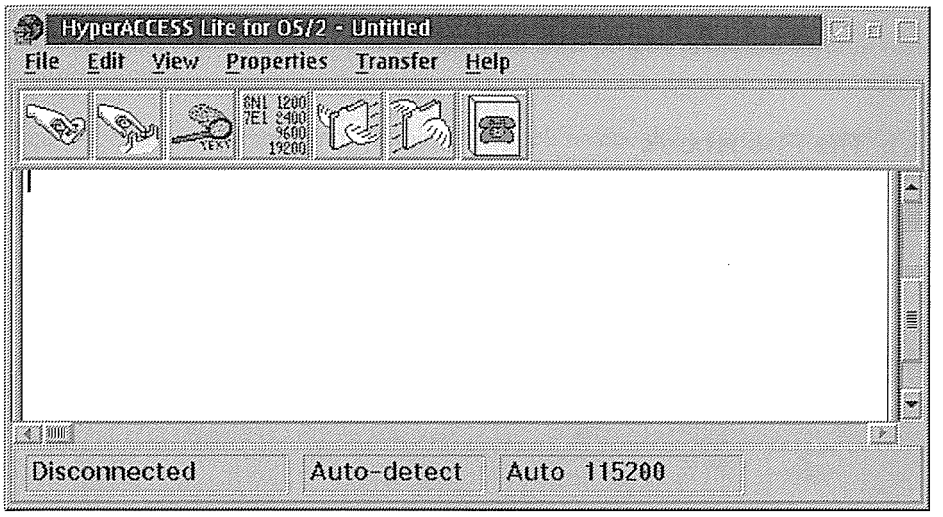

Figure 493. HyperACCESS Lite for OS/2 Window

HyperACCESS Lite supports modems with speeds ranging from 300 to 115,200 bps (bits per second). However, for communicating with most computer systems such as online services and bulletin board systems, you should use a modem with a speed of 2400 bps or higher.

HyperACCESS Lite provides both VT52 and VT100 terminal emulation, and supports the most popular file transfer protocols, including:

- Kermit
- Xmodem
- Ymodem
- Zmodem

HyperACCESS Lite includes a Phonebook in which you can keep details of the systems you use most frequently. HyperACCESS Lite provides a feature named CommSense, which automatically sets up your modem with the appropriate parity, data and stop bit information for the numbers in your Phonebook. To connect to any systems that have default settings, you only need to double-click your left mouse button on the corresponding icon.

If default settings are not available for some of the systems you want to communicate with, you should contact the system administrators of those systems for information about telephone numbers, line speeds and modem settings.

This section provides an overview of how to configure and use HyperACCESS Lite. However, you can always use the online help provided with the product to obtain more detailed information about how to take advantage of this application to meet your requirements.

12.5.1 The Phonebook

When you start HyperACCESS Lite, the first thing you will see is the Phonebook notebook, as shown in Figure 494. This notebook will overlay the HyperACCESS Lite for OS/2 window that is shown in Figure 493 on page 865.

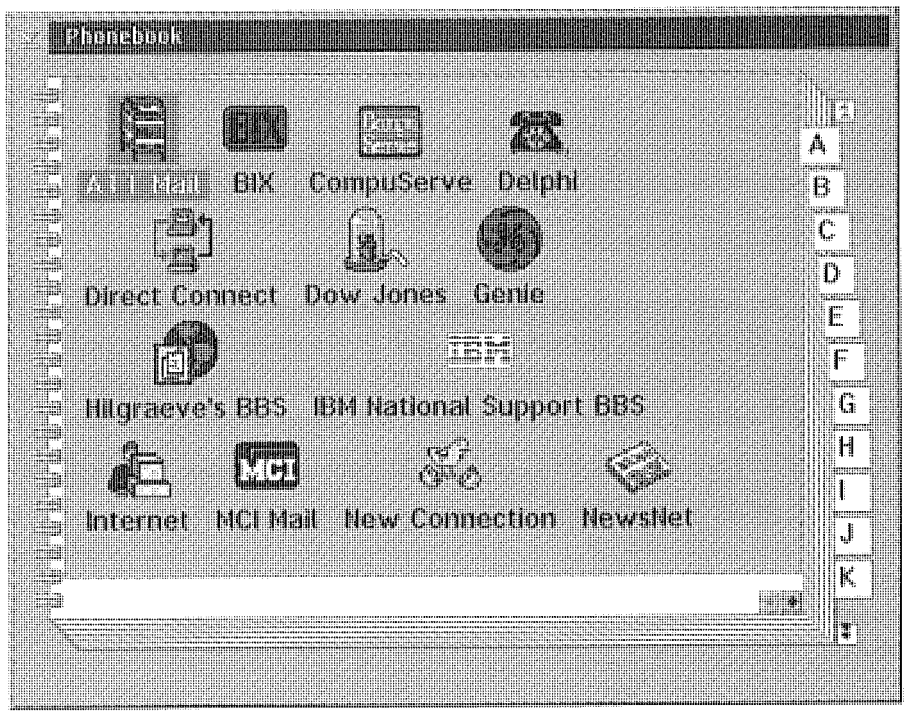

Figure 494. HyperACCESS Lite - Phonebook

The Phonebook notebook contains icons for the computer systems and bulletin board systems (BBS) to which you can connect. By default, the Phonebook includes telephone numbers for the most commonly used bulletin board systems and online services in the United States. You may add icons for other services that you want to use, as explained in 12.5.4, "Managing Phonebook Entries" on page 867.

You can access the Phonebook notebook at any time by selecting the **Phonebook** icon on the tool bar in the HyperACCESS Lite for OS/2 terminal emulation window. You can also access the notebook by selecting the **Open Phonebook** option from the File pull-down menu.

You can change the appearance of the Phonebook notebook by using the options available from the context menu that appears when you click your right mouse button anywhere over the notebook. This menu allows you to switch between the Icon View and the Details View of the notebook's contents. You can also choose between the options that show all entries or show tab letter only. This latter option may be useful when you have a very large number of entries in your Phonebook.

12.5.2 Connecting to a Remote System

All connections using HyperACCESS Lite are initiated from the Phonebook notebook. You must set up an entry for all the systems you will be accessing, unless a default entry is available. See 12.5.4, "Managing Phonebook Entries" for information on how to set up an entry in the notebook.

To dial an existing entry, simply double-click your left mouse button on its icon. If you wish, you can also connect by clicking your right mouse button on the icon to display its context menu, then selecting **Connect**. The Phonebook notebook will then disappear, and the name of the entry you are dialing will appear in the title bar of the HyperACCESS Lite for OS/2 window.

HyperACCESS Lite includes a feature called *auto-detect*, which allows HyperACCESS to determine the type of terminal emulation required by the system and set itself accordingly. This means that you do not need to know whether the system to which you are connecting requires VT52 or VT100 terminal emulation modes.

12.5.3 Disconnecting from a Remote System

To disconnect from a remote system, you can either click the **Disconnect** button on the tool bar in the HyperACCESS Lite for OS/2 window, or select the **Disconnect** option from the File menu. HyperACCESS Lite will end the terminal emulation session, hang up and disconnect the modem. If the remote system to which you are connected has a disconnect option, you can also use that option to disconnect.

12.5.4 Managing Phonebook Entries

HyperACCESS Lite allows you to maintain the entries in the Phonebook notebook, and to customize them to suit your own requirements. You can add new entries, change the details of existing entries, and delete entries from the notebook.

12.5.4.1 Adding an Entry

To add a new entry to the Phonebook notebook, go to the HyperACCESS Lite for OS/2 window, and select the **New** option from the File pull-down menu. HyperACCESS Lite will display the Description dialog, as shown in Figure 495.

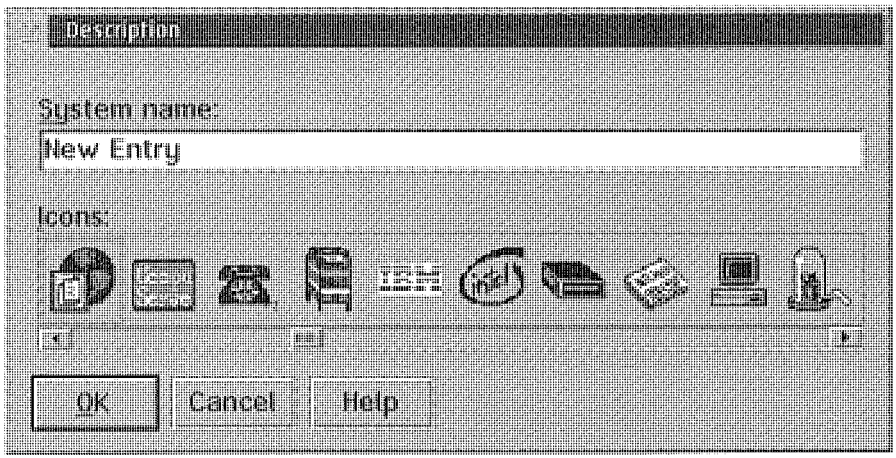

Figure 495. Adding a Phonebook Entry - Description

This dialog allows you to set the appearance of the new entry in the Phonebook notebook, by defining the name of the system to which you will connect, and the icon to use for this entry. Select the **OK** button to continue, and HyperACCESS Lite will display the Communications Settings dialog, as shown in Figure 496 on page 869.

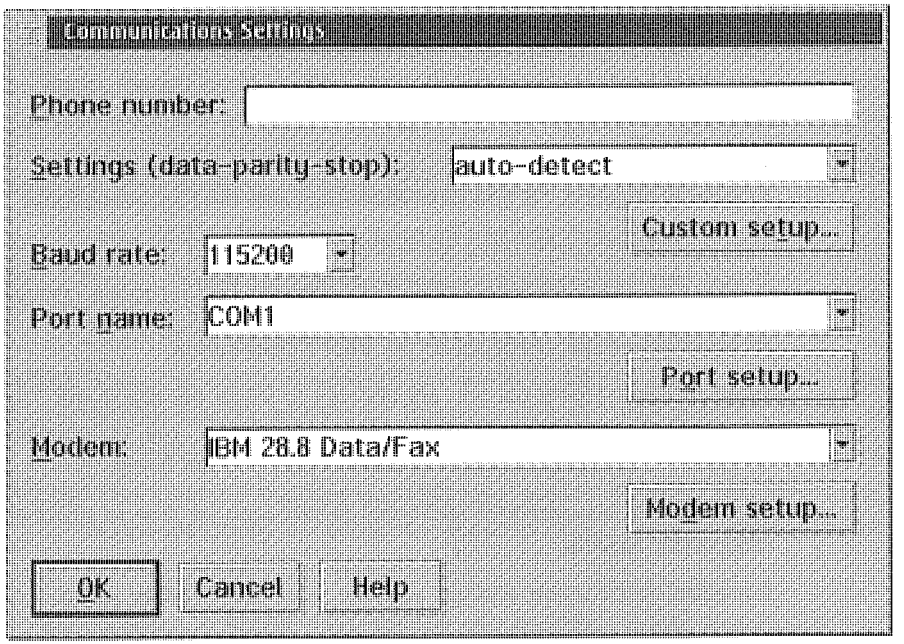

Figure 496. Adding a Phonebook Entry - Communications Settings

This dialog allows you to specify information related to the system to which you will connect:

Phone number This is the telephone number that your modem should dial to reach the remote system. You can include a long-distance prefix, an area code or an access code for an outside line.

Settings In this field, you are asked to configure data, parity and stop bit information. You can choose one of the following options:

- *Auto-detect* allows HyperACCESS Lite's CommSense feature figure out the data, parity and stop bit settings that are needed.
- *8-None-1*
- *7-Even-1*
- *7-Odd-1*

If none of these options match the requirements of the system to which you will connect, you can select the **Custom Setup** button to customize the specific settings to be used for this entry.

Baud rate You can select a baud rate (data transmission speed) for your modem, which determines the maximum transmission speed to be used. The range of speeds is from 300 to 115,200 bps. Typically, you should set the speed for HyperACCESS Lite to the next baud rate *above* your modem's rated speed.

Port name In this field you can select the communications port to which your modem is attached. If you have more than one modem, you should select the port that you will be using for HyperACCESS Lite.

If you need to customize additional settings for your communications port (such as software and hardware handshaking, or break signal duration), select the **Port Setup** button.

Modem From this drop-down list you are allowed to select the brand and model of your modem. If your modem is not listed, you can choose a modem that is compatible with the one that you are using.

The help function provides additional information on how to select a compatible modem.

For additional modem settings, you can select the **Modem setup** button. HyperACCESS Lite will display a dialog enabling you to enter extra modem setup commands, pulse or tone dialing options and timeout values.

Select the **OK** button to continue. HyperACCESS Lite will attempt to test the settings you have entered by immediately dialing the system listed in the entry.

12.5.4.2 Changing an Existing Entry

To change the settings for an existing entry in the Phonebook notebook, you must first open the entry by clicking your right mouse button on the appropriate icon and selecting the **Open** item from its context menu. When you have opened the entry, you must go to the HyperACCESS Lite for OS/2 window and select the **Communications Properties** button on the tool bar, or select the **Communications** option from the Properties pull-down menu. HyperACCESS Lite will display a Properties notebook, which contains pages identical to the dialogs shown in Figure 495 and Figure 496, plus some additional pages that allow you to alter the appearance and behavior of your terminal emulation sessions.

12.5.4.3 Deleting an Entry

To delete an existing entry from the Phonebook notebook, click your right mouse button on its icon, then select **Delete** from the resulting context menu. Note that you *cannot* delete an entry by dragging its icon over the Shredder object.

12.5.5 Terminal Emulation

The purpose of HyperACCESS Lite is to allow you to emulate terminals on remote systems such as bulletin board systems. You can use the same basic emulator to access multiple remote systems, but you must define each entry in your Phonebook notebook so that it has unique settings. Different systems require different types of terminal emulation, with which you will view text and respond to panel control codes as if you were working on that type of terminal.

HyperACCESS Lite offers the following terminal emulators:

ANSI ANSI is the method most frequently used by bulletin board systems, since it offers support for graphics characters and color codes.

VT52 This is an emulator standard developed by Digital Equipment Corporation to provide specific support for functions such as cursor memory, cursor reporting, tab stops, scrolling regions and host-controlled printer operations.

VT100 This emulator standard was also developed by Digital Equipment Corporation. It provides many of the same features as VT52 and also offers a 132-column mode.

You can configure the terminal emulator that you want to use by selecting the **Terminal Settings** option from the Properties notebook, shown in Figure 497 on page 872.

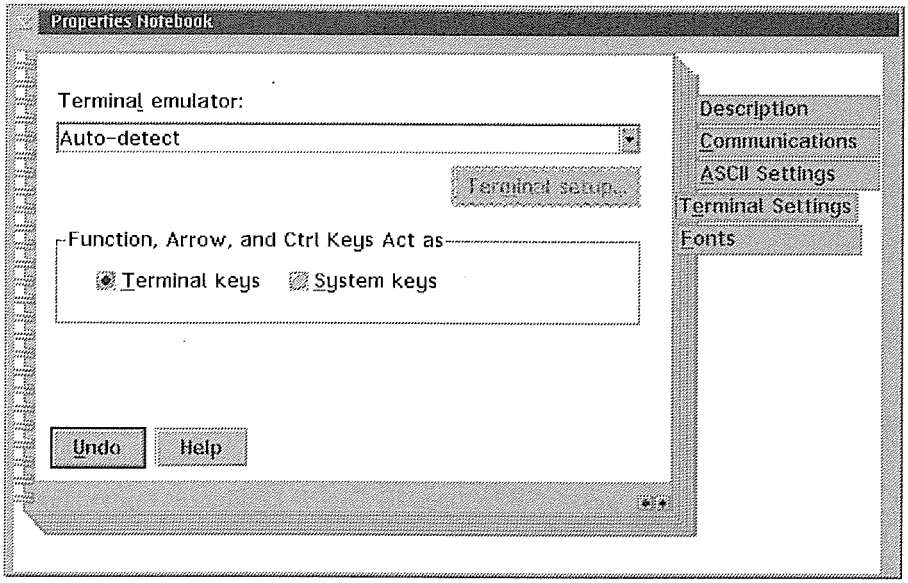

Figure 497. HyperACCESS Lite - Terminal Settings

In order to help you determine which type of terminal emulation you need to use for connecting a particular remote system, HyperACCESS Lite includes an auto-detect feature. When you connect to the remote system for the first time, this feature allows HyperACCESS Lite to automatically determine the best terminal emulation to use.

12.5.6 File Transfer

HyperACCESS Lite allows you to send and receive files to and from remote systems, using any of the following file transfer protocols:

- 1K Xmodem
- Xmodem-Auto
- Xmodem-CRC
- Xmodem-Checksum
- Ymodem
- Ymodem-G
- Zmodem
- Kermit
- Text

The protocol that you will use is determined dynamically for each file, at the time you send or receive it.

12.5.7 Receiving Files

You have to perform the following steps to receive a file from a remote system:

1. Tell the remote system to send the file. The command used here will be specific to the system being called.
2. Click the **Receive** button on the tool bar or select the **Receive** option from the Transfer menu.
3. Fill in the path and file name for the file to be received.
4. Select the protocol to be used.
5. Click on the **Receive** button.

HyperACCESS Lite will show you the progress of the receiving operation, and will inform you when the operation is complete.

12.5.8 Sending Files

When you are going to send a file to a remote system, you should perform the following procedure:

1. Tell the remote system to receive the file. The command used here will be specific to the system being called.
2. Click the **Send** button on the tool bar or select the **Send** option from the Transfer menu.
3. Fill in the path and file name for the file to be sent.
4. Select the protocol to be used.
5. Click on the **Send** button.

HyperACCESS Lite will show you the progress of the sending operation, and will inform you when the operation is complete.

12.5.9 Upgrading HyperACCESS Lite

The HyperACCESS Lite product supplied with OS/2 Warp 4 is an entry-level version. Although this does not imply that it is not full-featured, you may wish to upgrade the product to an enhanced version, which incorporates some additional capabilities:

- You can record and play back logons and other repetitive steps.
- You can define your own keys and buttons with text or bitmap labels.
- You can automate communications with a powerful script language.

- You can make the backscroll buffer as large as you want, enabling you to recall commands that you have previously typed. The buffer will even retain its contents from one call to the next.
- You can implement automatic virus scanning, and be protected from computer viruses in files you download.
- You can use additional terminal emulator types, file transfer protocols and connectivity options (more modems and network interfaces).

See the online documentation in HyperACCESS Lite for details related to the upgrade information.

12.5.10 Managing Your Appointments

PIM provides you with three different ways to view and manage your appointments:

- Daily using the Appointment Book object
- Monthly using the Planner object
- Yearly using the Year Calendar object

These three objects all store information in a common database, so that PIM maintains a consistent record of your appointments, no matter how you choose to view them. For example, if you make appointments on a daily basis using the Appointment Book object, you can view a summary of your appointments for the current month by using the Planner object. Any changes you make in one view are automatically reflected in the others.

12.5.11 Daily Appointments - The Appointment Book

The Appointment Book object allows you to schedule and view your appointments on a daily basis. To open the Appointment Book, double-click your left mouse button on the Appointments object in the IBM Works folder. OS/2 Warp 4 will display a window like that shown in Figure 498 on page 875.

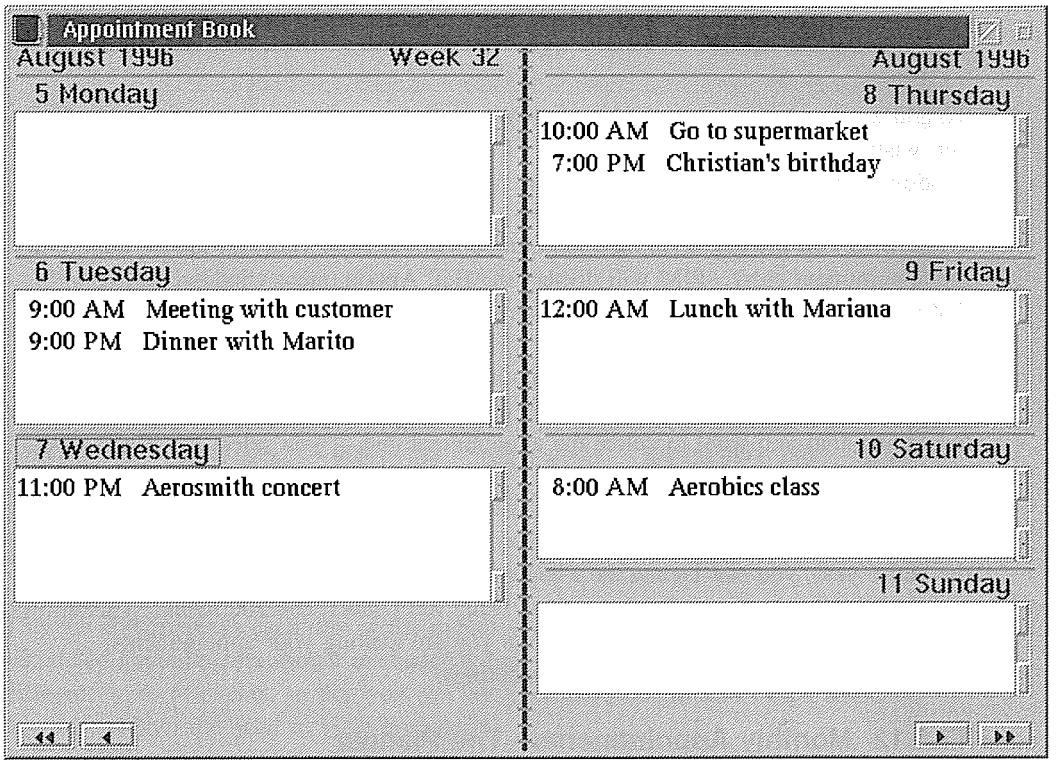

Figure 498. PIM - Appointment Book Window

By default, the Appointment Book shows a full week; that is, Monday through Sunday. You can change the window to display a number of other views, using the Appointment Book context menu. To display this menu, click your right mouse on a blank area of the window (that is the grey area). Select **Open**, then select your preferred view from the resulting cascade menu. You can display up to two weeks in the Appointment Book window.

You can turn the pages of the Appointment Book window using the arrow and double-arrow buttons at the bottom of the window. The arrow buttons move the dates in the window forward or backward by one week (or one day if you are using the Daily View), while the double arrow buttons move dates forward or backward by two weeks (or one week in the case of the Daily View).

Directly below each date in the Appointment Book window is the list of appointments that you have scheduled for that day. The current day (that is, today) is outlined with

a red border around its date. Each day is divided into time slots; the default time slot is 30 minutes, but you can modify this setting if you wish (see 12.5.29, "Configuring PIM" on page 900).

To add a new appointment, double-click your left mouse button on the day for which you wish to schedule the appointment. PIM will display the New Appointment window, which is described in 12.5.14.1, "Adding a New Appointment" on page 880.

To view or edit the details of an appointment, double-click your left mouse button on the appointment entry. PIM will display the Edit Appointment window, which is described in 12.5.14.2, "Editing an Existing Appointment" on page 881.

To delete an appointment, select the appointment entry, click your right mouse button on it to display the entry's context menu, and select the **Delete** item. PIM will ask you to confirm that you want to delete the appointment and, if you select the **Yes** button, delete it from the database.

If you wish to view your appointments for an entire month, or view the calendar for the entire year, you can launch the Planner or Year Calendar objects from the context menu of the Appointment Book window, using the Launch cascade menu. This allows you to easily check for any conflicts when you are making your appointments, particularly when scheduling recurring meetings.

12.5.12 Monthly Appointments - The Planner

You can view your appointments for an entire month using the Planner object. To start the Planner object, double-click your left mouse button on its icon in the IBM Works folder. OS/2 Warp 4 will display the Planner window as shown in Figure 499 on page 877.

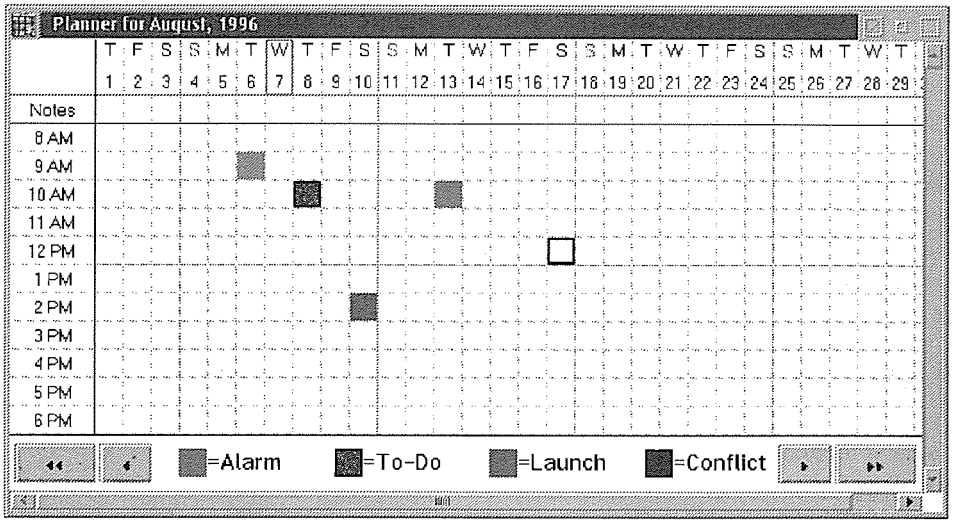

Figure 499. PIM - Planner Window

This window displays each day of the month, with the time slots for which you have scheduled appointments shown in shaded form. Different colors are used to denote different types of events, so that you can interpret the information in the Planner window without the need to view each entry.

Note that if you schedule more than one appointment for the same time, the Planner window shows a solid black entry for that time slot. This allows you to easily see any such conflicts, and to rectify them.

You can switch the Planner window to the next or previous month or year using the Planner window's context menu. To display this menu, click your right mouse button on the upper or left-hand portion of the window (where the date and time slot labels are shown). Select the option you require from the View cascade menu.

If you want to view the details of an entry in the Planner window, click and hold down your left mouse button on the entry. A small window will appear next to your mouse cursor, showing the appointments that you have scheduled within that time slot.

You can view or edit the details of an appointment by continuing to hold down your left mouse button while moving your mouse cursor over the appointment's entry in the small window. Release the mouse button, and PIM will display the Edit Appointment window, which is described in 12.5.14.2, "Editing an Existing Appointment" on page 881.

You can add a new appointment to a time slot by selecting the time slot with your left mouse button, then clicking your right mouse button on the time slot to display the time slot's context menu and selecting the **New...** item. PIM will display the New Appointment window as described in 12.5.14.1, "Adding a New Appointment" on page 880.

Similarly, you can delete an appointment from the Planner window by selecting a time slot, displaying the context menu and selecting the **Delete** item. PIM will display a Delete Appointment window showing the appointments that you have scheduled for that time slot. You can delete one or more appointments by selecting them from the list in the Delete Appointment window, then selecting the **Delete** button.

12.5.13 Yearly Appointments - The Year Calendar

You can view a calendar for the entire year using the Year Calendar object, and use this view to launch the Planner or Appointment Book objects. To start the Year Calendar object, double-click your left mouse button on its icon in the IBM Works folder. OS/2 Warp 4 will display the Calendar window as shown in Figure 500 on page 879.

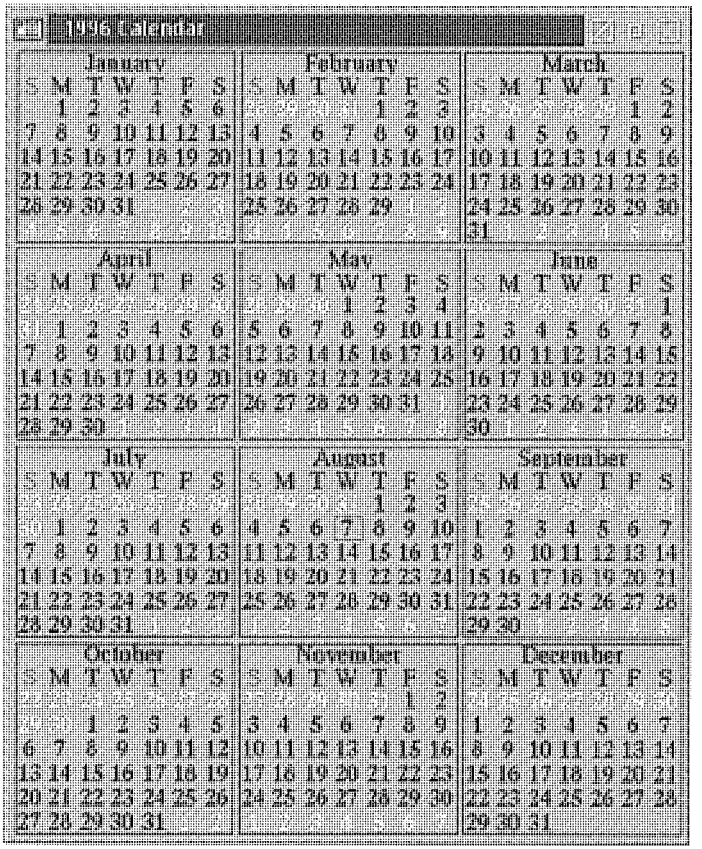

Figure 500. PIM - Year Calendar

This window shows the calendar for the entire year, with the current date highlighted by a red border. From this window, you can:

- Open the To-Do List for any date (see 12.5.17, "Keeping Track of Important Tasks - The To-Do List" on page 886) by double-clicking your left mouse button on the date's entry in the calendar
- Launch the Appointment Book, Planner or other PIM facilities by clicking your right mouse button on the Calendar window to display the window's context menu, then selecting the facility you require

You can switch the Calendar window to display the next or previous year, by clicking your right mouse button on the window to display the context menu, then selecting the option you require from the View cascade menu.

12.5.14 Scheduling Appointments

PIM allows you to make, alter and delete appointments. How you select a time slot or existing appointment depends on the view (Appointment Book, Planner or Calendar) that you are currently using, but the mechanism by which you make and edit appointments is the same for all views.

12.5.14.1 Adding a New Appointment

You can add a new appointment from the Appointment Book or Planner windows. PIM will display the New Appointment window, as shown in Figure 501.

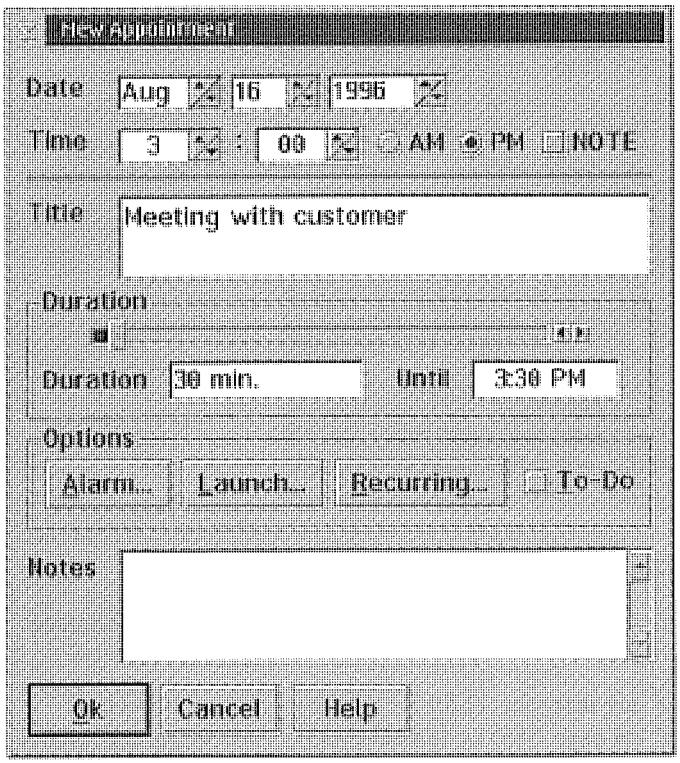

Figure 501. PIM - New Appointment Window

You can also add an appointment by dragging an item from the Contacts List or the Phone Book onto a time slot in the Appointment Book or Planner windows (see 12.5.17, "Keeping Track of Important Tasks - The To-Do List" on page 886 and for more information on managing your contacts).

In the New Appointment dialog, you can define the date, time, title and duration of your appointment. Wherever possible, PIM will provide default information for these fields, so that you only need to enter information that PIM does not already know.

As well as the essential details of your appointment, you can instruct PIM to provide you with an alarm warning you when the appointment is imminent (see 12.5.15, "Setting Alarms" on page 883), schedule a recurring appointment, add notes, etc. If you select the **To-Do List** check box, PIM will automatically add the appointment to your To-Do List (see 12.5.17, "Keeping Track of Important Tasks - The To-Do List" on page 886).

You can also schedule an appointment from your To-Do List, by dragging and dropping an entry from the To-Do List window to the Appointment Book or Planner windows. See 12.5.17, "Keeping Track of Important Tasks - The To-Do List" on page 886 for more information on the To-Do List.

Warning!

When you schedule an appointment from your To-Do List, the item is actually *moved* from the To-Do List window to your Appointment Book and Planner windows; its entry in the To-Do List window is removed. To retain the entry in both the To-Do List window and the Appointment Book/Planner windows, press and hold down the Ctrl key while dragging and dropping the entry.

PIM allows you to automatically schedule a program to be run at a particular date and time. This facility allows you to schedule tasks such as hard disk backups and have them run even if you are not there. See 12.5.16, "Scheduling Programs" on page 885 for more information on how to schedule programs in this way.

12.5.14.2 Editing an Existing Appointment

If you simply wish to reschedule an appointment from one date to another, you can use the drag and drop techniques described in 12.5.14.3, "Rescheduling an Appointment" on page 882. The time slot and other details of the appointment will not change.

If you want to change the time of an appointment within the same day, or you want to view or edit the details of an appointment, you should select the appointment's entry in the Appointment Book or Planner windows. PIM displays the Edit Appointment window as shown in Figure 502 on page 882.

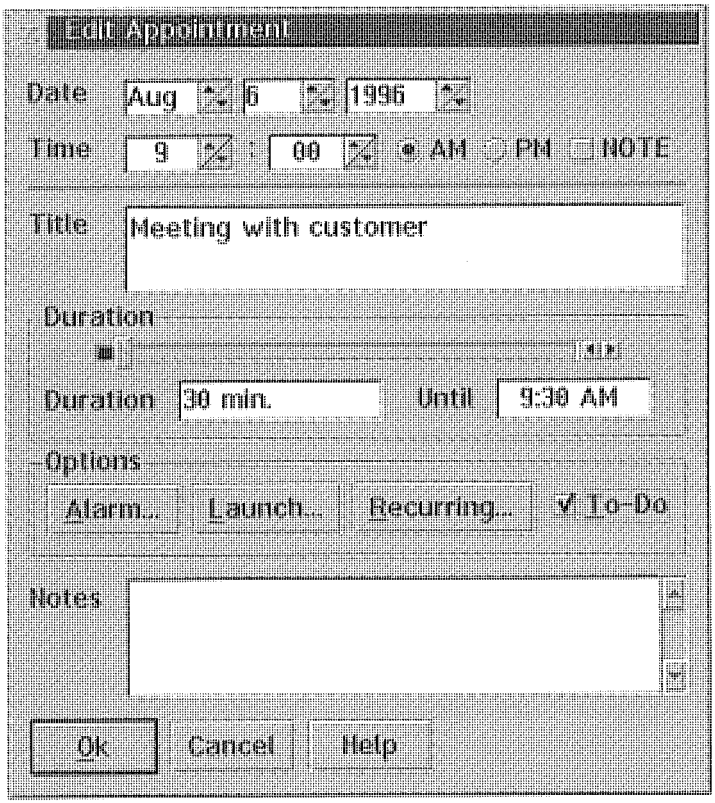

Figure 502. PIM - Edit Appointment Window

In this window, you can reset the date and time for the appointment, change the duration of the appointment, add notes, etc. You can instruct PIM to provide you with an alarm warning you when the appointment is imminent (see 12.5.15, "Setting Alarms" on page 883), and schedule a recurring appointment.

When you have entered all the information you require, select the **OK** button to add the appointment to the database. This appointment will now appear in all views.

12.5.14.3 Rescheduling an Appointment

If you wish to move an appointment from one date to another, you can do this by selecting the appointment's entry in the Appointment Book or Planner windows, and dragging the entry to another date in the Appointment Book, Planner or Calendar windows.

12.5.14.4 Deleting an Appointment

To delete an existing appointment, you can use one of two methods:

- Drag its entry to the Shredder object on your desktop.
- Select its entry in the view you are using. Click your right mouse button on the entry to display a context menu, and select **Delete**.

PIM will ask you to confirm that you want to delete the item. If you select **Yes**, PIM will then delete the appointment's entry from the database.

12.5.15 Setting Alarms

PIM allows you to set up to ten alarms that warn you of imminent appointments or events. You can set an alarm to display a pop-up menu with a message, or to give you an audible "beep" only.

There are two different types of alarms:

- You can set an alarm to occur at a specified time interval before an appointment. For example, you might have a meeting with Bob in his office at 10am. You can instruct PIM to remind you fifteen minutes beforehand, so that you have time to walk over to Bob's office.
- You can set an alarm to occur at a specified date and time, without relating it to an appointment. Such alarms can be recurring if you wish. For example, you can set an alarm to occur every Monday morning at 11am.

To set an alarm that will remind you of an appointment, select the **Alarm...** button in the New Appointment or Edit Appointment windows. PIM will display the Appointment - Alarm window, as shown in Figure 503.

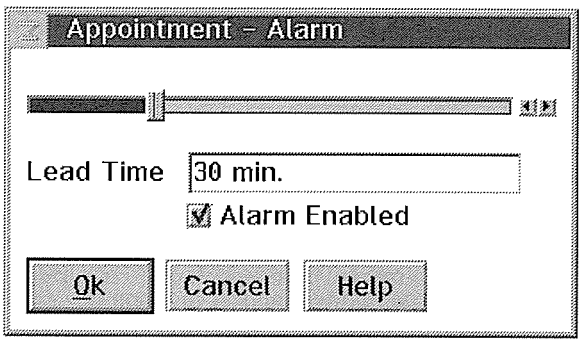

Figure 503. PIM - Appointment - Alarm Window

In this window, you can set the amount of lead time you require, using the slider. You can also turn and existing alarm off and on again. When you have set the alarm, select **OK** to return to the New Appointment or Edit Appointment window.

Note that for alarms that warn you of appointments, you *must* use a pop-up window for the alarm. The option to have only an audible alarm is not available for this type of alarm, since PIM needs to tell you about the appointment.

To set an alarm that is not related to an appointment, display the context menu of the Appointment Book, Planner or Calendar windows, then select **Alarms...** from the Options cascade menu. PIM will display the Alarm window as shown in Figure 504.

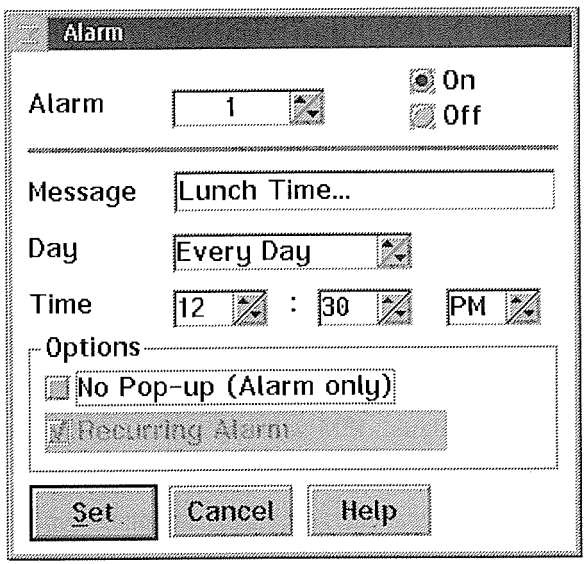

Figure 504. PIM - Alarm Window

This window allows you to set an identifier for the alarm, and specify the day and time at which you want the alarm to occur. You can set an alarm for any day in the next week, or you can select the **Recurring Alarm** check box to have the alarm occur every week on that day, at the specified time.

The Alarm window allows you to specify a message that will appear in a pop-up window on your panel when the alarm occurs. If you want the alarm to sound as an audible alarm only, with no pop-up menu, select the **No Pop-up (Alarm only)** check box.

The Event Monitor

When you open any PIM objects, PIM will automatically start a task named the Event Monitor. This task keeps track of the current date and time, and handles events such as alarms and launching of programs. When the Event Monitor is running, you will see an entry for it in the Window List. Do not shut down this task, or you will not be able to launch programs automatically or receive alarms from PIM.

You can edit the details of an alarm, or delete an alarm, using the same methods as you would use for a regular appointment. See 12.5.14.4, "Deleting an Appointment" on page 883 for details.

12.5.16 Scheduling Programs

PIM allows you to schedule a program to run on a specified day at a particular time. This allows you to schedule a program, such as a hard disk backup, to run automatically even if you are not present.

To run a program, you must "make an appointment" for the program to run. You do this in the same way that you make a regular appointment, as described in 12.5.14.1, "Adding a New Appointment" on page 880. In the New Appointment window, click on the **Launch...** button. PIM will display the Appointment - Launch window as shown in Figure 505.

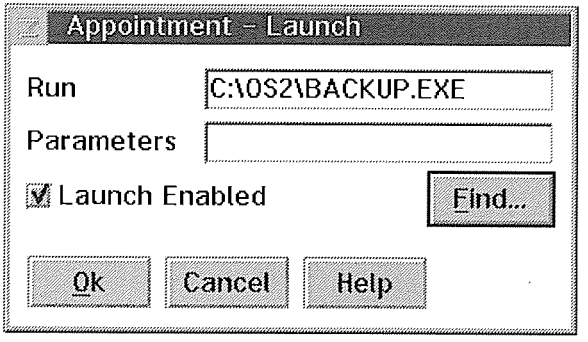

Figure 505. PIM - Appointment - Launch Window

This window allows you to specify the name of program that you want to run (for example, BACKUP.EXE) and any parameters you want to provide to the program.

If you enter only the program name, the program *must* reside in a directory contained in the PATH statement in your OS/2 Warp 4 CONFIG.SYS file. If it does not, PIM will display an error message, indicating that it could not find the program file. You can enter the full drive and path name for the file (for example, C\TOOLS\BACKUP\BACKUP.EXE) or, if you are not sure of the full path and file name, you can click on the Find... button to locate the program.

When you have entered all the required information, select **OK** to save the entry. This "appointment" will now appear in the Appointment Book and Planner windows, with its entry colored green to distinguish it from regular appointments.

12.5.17 Keeping Track of Important Tasks - The To-Do List

PIM provides a To-Do List that allows you to manage tasks that you need to perform. To start the To-Do List, double-click your left mouse button on its icon in the IBM Works folder. OS/2 Warp 4 will start the To-Do List and display two windows; these are the To-Do List Launcher and To-Do List windows, as shown in Figure 506.

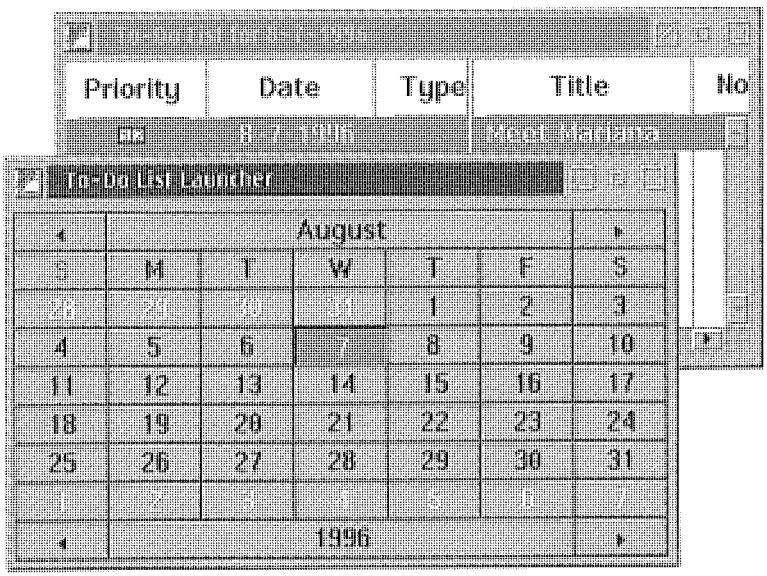

Figure 506. PIM - To-Do List

The To-Do List Launcher window displays a calendar for the current month, while the To-Do List window displays a list of items for the current date.

Using the To-Do List Launcher window, you can:

- Change the date for the To-Do List window by double-clicking your left mouse button on any date in the To-Do List Launcher window
- Launch the Planner object by selecting the current month displayed at the top of the To-Do List Launcher window
- Display the next or previous month in the To-Do List Launcher window by selecting the arrow buttons to the left and right of the current month
- Launch the Year Calendar object by selecting the current year displayed at the bottom of the To-Do List Launcher window
- Display the next or previous year in the To-Do List Launcher window by selecting the arrow buttons to the left and right of the current year

You can set alarms from within the To-Do List Launcher window by displaying the window's context menu (click your right mouse button on the border of the window), then selecting the **Alarms...** item from the Options context menu. PIM will display the Alarm window as described in 12.5.15, "Setting Alarms" on page 883.

The To-Do List window displays a list of tasks for the current day selected in the To-Do List Launcher window. In the To-Do List window, you can add, view, edit and delete items, or mark them as completed. The following sections explain how to do each of these things.

12.5.18 Adding a New Item

To add a new item to the To-Do List window for a particular date, display the window by selecting the date from the To-Do List Launcher window. Double-click your left mouse button on the To-Do List window, and PIM will display the To-Do Item - Information window, as shown in Figure 507 on page 888.

Figure 507. PIM - To-Do Item - Information

In this window, you can define the name of the task, the type of task (for example, *Report* or *Phone call*) and its priority. You can add whatever type of task you want in the Type field. PIM saves all the types you define so that you can select them from the drop-down list if you wish to use the same type later. This allows you to customize the types of tasks in your To-Do List, to suit your own needs.

You can specify one of five priority levels for each item in your To-Do List, or you can select the **Date** radio button to assign a date to the task. If you select this option, you can also specify that this task is to be a recurring item in the list, by selecting the **Recurring...** button. Selecting this button will display the Recurring To-Do Items window, which allows you to set the start date, frequency and duration of the task.

You can add an item to the To-Do List window from the Appointment Book window, in either of two ways:

- Select the **To-Do List** check box in the New Appointment or Edit Appointment windows. PIM will automatically add the appointment to the To-Do List window.

- Select an appointment from the Appointment Book window, then drag and drop it onto the To-Do List window. The appointment will retain its current date, starting time, duration and all other information, no matter which date is currently showing in the To-Do List window. The type of task will be automatically set to *Appointment*. The entry for the appointment in the Appointment Book and Planner windows will turn blue to indicate that it is a To-Do List item.

Appointments in the To-Do List are set with a date priority using the same date set in the Appointment Book window. You cannot modify the priority of a To-Do List item that was created in this way.

12.5.19 Editing an Existing Item

To edit an existing item in the To-Do List window, double-click your left mouse button on its entry. For items that you added from within the To-Do List window, PIM will display the To-Do Item - Information window, as described in 12.5.18, "Adding a New Item" on page 887.

You can edit any of the information in this window. The fields and options available are exactly the same as those for a new item.

If you added the item from the Appointment Book window, you cannot modify the priority or type of the item. PIM will display the Edit Appointment window (see Figure 502 on page 882), allowing you to edit the appointment entry. Any changes that you make will be reflected in the Appointment Book and Planner windows, as well as the To-Do List window.

12.5.20 Marking a Completed Item

When you complete an item in your To-Do List, you should mark its entry as complete in the To-Do List window. Click your right mouse button on the item's entry to display its context menu, then select the **Mark as complete** item.

12.5.21 Deleting an Item

You can delete an item from the To-Do List in several ways:

- Select the item (or a group of items), display a context menu by clicking your right mouse button on the items, and select the **Delete** menu item.
- Drag and drop the selected item(s) onto the Shredder on your desktop

Note that if you delete an appointment from the To-Do List, it will not automatically be deleted from the Appointment Book and Planner windows. You must delete the appointment from one of those windows.

12.5.22 Sorting the List

You can sort the items in your To-Do List window in one of two ways:

- By priority, where the highest-priority items appear first. If more than one item has the same priority, these items are sorted alphabetically by type, then title.
- By type, where items appear in alphabetical order by type. If more than one item has the same type, these items are sorted by priority, then alphabetically by title.

To change the sort order of your list, display the context menu and select the option you require from the Sort cascade menu.

12.5.23 Managing Names and Addresses

The Phone/Address Book object provides you with a convenient way to store the names, addresses and telephone numbers of your personal and business contacts. It also provides extra fields that you can customize to contain whatever information you desire.

To start the Phone/Address Book object, double-click your left mouse button on its icon in the IBM Works folder. OS/2 Warp 4 will display the Phone Book window as shown in Figure 508.

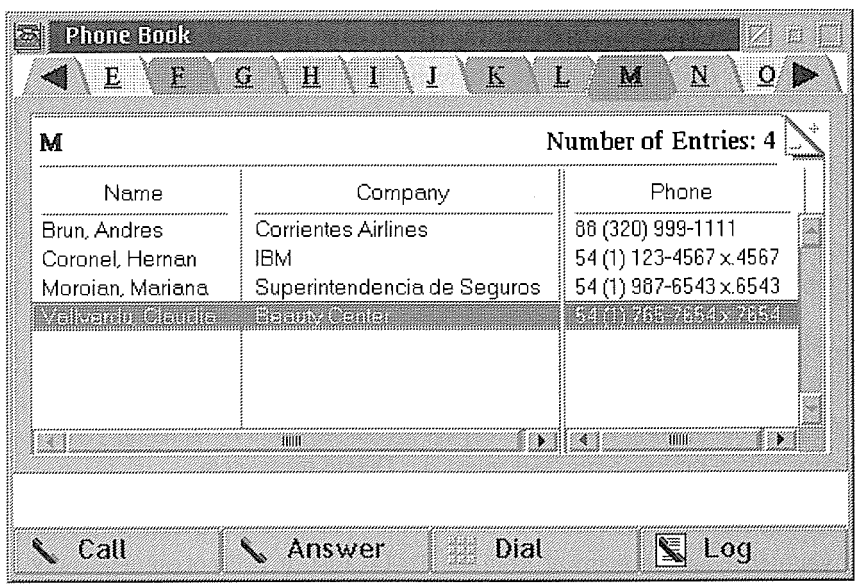

Figure 508. PIM - Phone/Address Book

This window takes the form of a notebook, with all your contacts displayed in alphabetical order. You can add, edit or delete entries from this notebook. You can also copy an existing entry to create a new entry with similar information; for example, you might have two contacts at the same company, with the same business address. When creating the entry for the second contact, you can copy the information in the first entry, and just change the name and telephone number. This saves you entering the same information twice.

12.5.24 Maintaining the Phone/Address Book

The Phone Book notebook allows you to add, view, edit or delete entries. You can also copy an entry to a Contact List window (see 12.5.27, "Quick Reference - The Contact List" on page 898) for easy reference.

12.5.24.1 Adding an Entry

To add a new entry to the Phone Book notebook, double-click your left mouse button on any area in the notebook other than an entry in the list. PIM will display the New Entry notebook, as shown in Figure 509 on page 892.

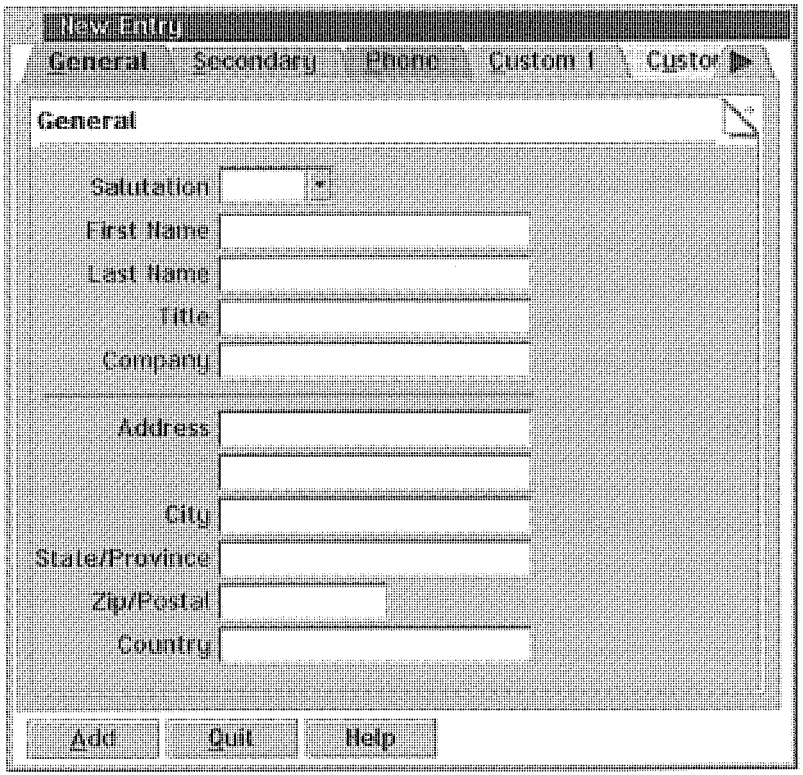

Figure 509. PIM - Adding a Phone Book Entry

The fields in this notebook are organized into the following pages:

General This page contains basic information for the entry. You can specify the following fields:

- Salutation
- Last Name
- First Name
- Title
- Company
- Address
- City
- State/Province
- Zip/Postal
- Country

Secondary This page contains additional information about the entry, such as:

- A group of Address fields that can be used to store a secondary address.
- An Icon field that contains the name of the icon that is used to represent the entry in the Phone Book. This icon is shown when the Phone Book is displayed in Icon view and whenever you drag and drop the entry.

  Selecting the **Find** button displays the Find Icon dialog, which allows you to retrieve an icon file from anywhere on your hard disk.
- The Last Edited field, which contains the time and date when the entry's record was last edited. Any modifications to an entry's record cause this field to be updated with a new time and date.

Phone The Phone page contains a list of phone numbers for the entry. You can store up to eight different phone numbers for each entry. You can use phone labels to identify each number wherever it is displayed.

Custom You can use the Custom pages to store additional information about the entry. These pages are useful to customize the information that you store in each entry, to meet your own needs.

See 12.5.29, "Configuring PIM" on page 900 for information on how to customize the fields on the Custom pages.

Notes This page allows you to store notes about the entry, and is useful for storing information that is not covered in any of the other pages. You can enter up to 512 characters.

When you have completed all the information for the entry, select the **Add** button to add the entry to your Phone Book notebook.

12.5.24.2 Editing an Existing Entry

To edit an existing entry, double-click your mouse on the entry in the Phone Book window. PIM will display a notebook like that shown in Figure 510 on page 894.

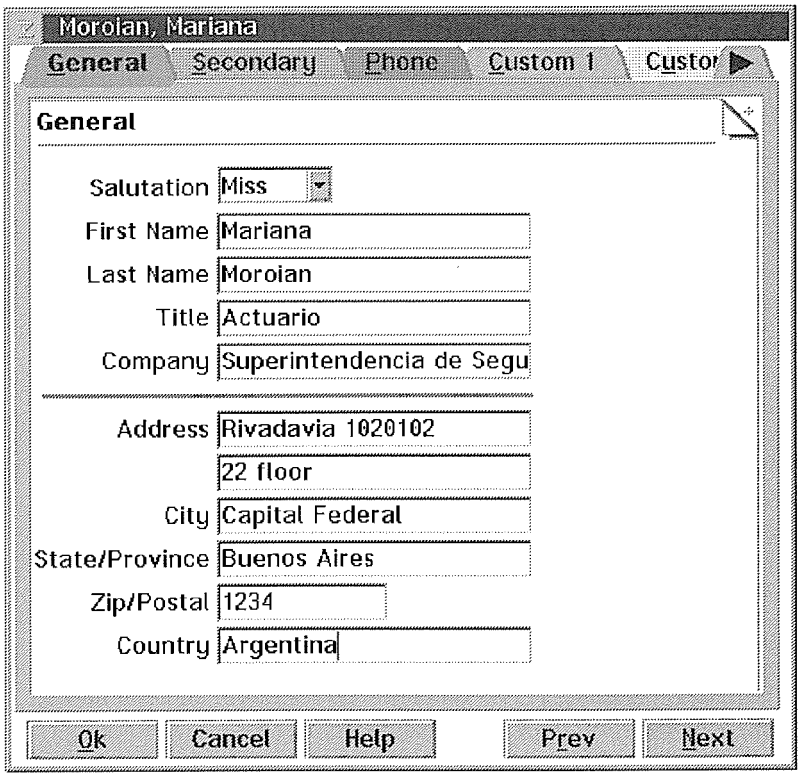

Figure 510. PIM - Editing a Phone Book Entry

You can change any or all of the fields in the entry. When you have completed your changes, select the **OK** button to save your changes. If you wish, you can switch between entries using the **Prev** and **Next** buttons; any changes that you make are preserved when you switch to another entry.

12.5.24.3 Deleting an Entry

You can delete an entry from the Phone Book notebook in two ways:

- Display the entry's context menu by clicking your right mouse button on it, then select the **Delete** item from the menu
- Drag and drop the entry on the Shredder object on your desktop

PIM will display a warning message, telling you that all phone log entries (see 12.5.25, "Managing Incoming and Outgoing Phone Calls" on page 895) associated with this entry will be deleted, and asking you to confirm that you want to delete the

entry. If you select **Yes**, the entry will be deleted from the Phone Book window and the PIM database.

12.5.25 Managing Incoming and Outgoing Phone Calls

PIM allows you to keep records of your incoming and outgoing telephone calls in a phone log, from which you can view details of your calls at a later time. At the bottom of the Phone Book window are four buttons that you can use to keep records of your incoming and outgoing calls:

Call Allows you to keep a record of an outgoing call, and will optionally dial the number for you.

Answer Allows you to keep a record of an incoming call.

Dial Launches PIM's own Phone Dialer utility. If you have set up a modem when configuring PIM, you can use this utility to dial your phone from the Phone Dialer window rather than using your telephone handset.

Log Allows you to view the phone log.

You can record information about a call in the phone log, and also launch other PIM facilities such as the Appointment Book or To-Do List, enabling you to schedule meetings and record commitments as you handle the call.

12.5.25.1 Outgoing Calls

When you select an entry in the Phone Book notebook and select the **Call** button, or drag an entry over the Call button, PIM will take the phone number from the entry in the notebook and display a Calling... dialog like that shown in Figure 511.

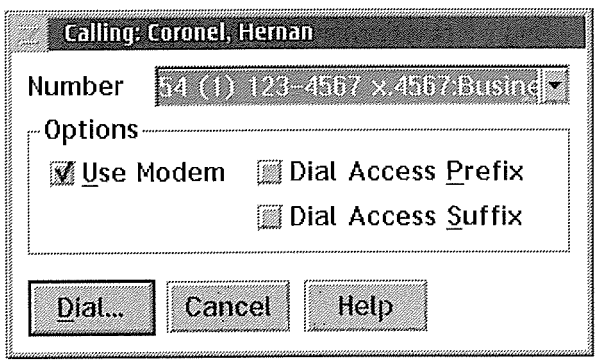

Figure 511. PIM - Making an Outgoing Call

If you have set up a modem when configuring PIM, PIM gives you the option of having it dial the number for you, by selecting the **Use Modem**, **Dial Access Prefix** and **Dial Access Suffix** check boxes. The use of these options is explained in 12.5.29, "Configuring PIM" on page 900.

Select the **Dial...** button, and PIM will either dial the number or, if you do not select the **Use Modem** check box, display a Calling... notebook.

In this notebook, the Outgoing tab shows the elapsed time of the call, and allows you to record the status of the call and any notes you might want to make. The To-Do... and Appointment... buttons allow you to launch the To-Do List and Appointment Book objects, so you can schedule appointments and record any important tasks from this notebook while you are talking on the phone.

The Phone Log tab allows you to view the phone log, so that you can refer to previous calls while you are talking on the phone. The phone log is discussed in 12.5.25.3, "Viewing the Phone Log" on page 897.

When you have finished the call, select the **Hang up** button to save the information in the phone log. If you used PIM to dial the number, selecting this button will terminate the connection.

12.5.25.2 Incoming Calls

The process of handling an incoming call is very similar to that of logging an outgoing call. Select the entry in the Phone Book notebook for the person who has called you, then select the **Answer** button, or simply drag the entry over the Answer button. PIM will display the Answering... notebook.

In this notebook, the Incoming tab allows you to note the elapsed time of the call and any notes that you might want to make. The To-Do... and Appointment... buttons allow you to launch the To-Do List and Appointment Book objects, so you can schedule appointments and record any important tasks from this notebook while you are talking on the phone.

The Phone Log tab allows you to view the phone log, so that you can refer to previous calls while you are talking on the phone. The phone log is discussed in 12.5.25.3, "Viewing the Phone Log" on page 897.

When you have finished the call, select the **Hang up** button to save the information in the phone log.

12.5.25.3 Viewing the Phone Log

To view information in the phone log, select the **Log** button in the Phone Book notebook. PIM will display the Phone Log window as shown in Figure 512.

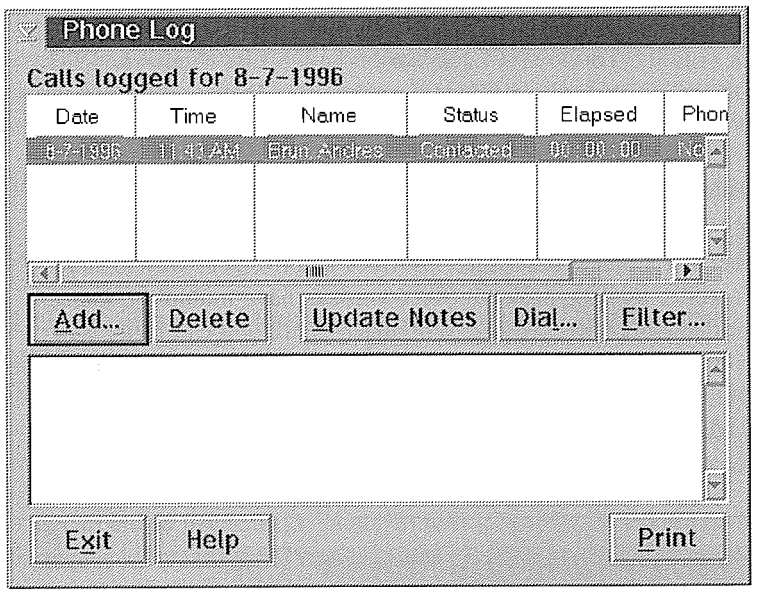

Figure 512. PIM - Phone Log Window

This window allows you to view the information in the phone log. In this window, you can:

- Add a new record to the phone log by selecting **Add...**
- Update the notes for an existing record by making changes in the entry field at the bottom of the window, then selecting **Update Notes**
- Delete an existing record by selecting **Delete** or by dragging the record over the Shredder object on your desktop
- Initiate a call by selecting **Dial...**
- Select **Filter...** to display only the calls to and from particular individuals, or calls made on particular dates

You can print the phone log from this window if you wish, by selecting the **Print** button at the bottom right.

12.5.26 Scheduling Meetings and Follow-Up Activities

You can schedule an appointment with a contact from the Phone Book notebook, by dragging the entry in the notebook to the Appointment Book or Planner windows. PIM will display the New Appointment window as shown in Figure 501 on page 880.

You can create a follow-up entry in your To-Do List by dragging the entry in the Phone Book notebook onto the To-Do List Launcher or To-Do List windows. PIM will display the To-Do Item - Information window as shown in Figure 507 on page 888.

12.5.27 Quick Reference - The Contact List

You can use a Contact List object to store and display a subset of the entries in your Phone Book notebook. The Contact List object provides a convenient way to store contacts related to a specific topic or project. Since you can have multiple Contact List objects, and store them anywhere in your Workplace Shell, you can create and store these objects along with other Workplace Shell objects that relate to specific subjects. For example, if you are working on a budget proposal, you could keep the names and contact details of people working with you in a folder with the documents for your proposal. An example of a contact list is shown in Figure 513.

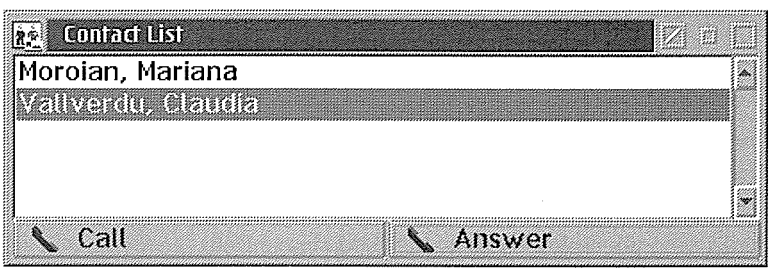

Figure 513. PIM - Contact List

Entries in a Contact List object are effectively "shadows" of the entries in the Phone Book notebook. You can perform the same actions on items in a Contact List window that you can perform on entries in the Phone Book notebook. Any changes that you make in the Contact List window are reflected in the Phone Book and vice versa. However, deleting an entry from the Contact List object deletes it *only* from this subset, not from the Phone Book notebook.

To create a Contact List object, drag the Contact List template from the IBM Works folder to the location where you want the new object to reside. OS/2 Warp 4 will automatically create a blank contact list. You can then add entries to the Contact List

object by selecting one or more entries in the Phone Book notebook, and dragging and dropping them on the Contact List object.

You can edit an existing entry from the Contact List window, by double-clicking your left mouse button on the entry. PIM will display the same window shown in Figure 510 on page 894, allowing you to update the entry. Any changes you make in the Contact List window are automatically reflected in the Phone Book notebook and in the database. Remember, however, which deleting an entry from the Contact List window *does not* delete it from the Phone Book notebook or the database.

The Contact List window contains two buttons that allow you to handle incoming and outgoing calls. These buttons provide the same functions as the corresponding buttons described in 12.5.25, "Managing Incoming and Outgoing Phone Calls" on page 895.

12.5.28 Making Miscellaneous Notes - The Notepad

The Notepad is a free-form notebook that allows you to store almost any type of information. You can add information on multiple pages, and PIM automatically creates a table of contents to track each page that you add. A page may contain either text or graphics, but the limit for text is 4 KB per page.

You can create pages in the Notepad to contain two different types of graphic files: bitmaps and metafiles. When you store a picture in the Notepad, the size of the picture is adjusted to fit the page-size of the Notepad window. When you change the size of the Notepad window, the size and scaling of the picture changes accordingly.

When you first open the Notepad object, it contains only the table of contents; there are no pages. You can add pages in either of two ways:

- Insert them before the selected page in the table of contents by clicking on **Insert** in the Notepad context menu.
- Append them to the end of the table of contents by clicking on **Append** in the Notepad context menu.

In both cases, the Notepad - Page Information dialog will appear, in which you can complete the following information:

Title Text that is displayed at the top of the page, used to identify the page in the table of contents. The text limit is 64 characters (if it is longer, it will be truncated).

Insert This spin button is used when you are inserting or appending more than one page, to indicate the number of pages you wish to add. The maximum is 20.

Type You may specify three different types of information that the page will display:

- *Text* creates a page with a multiline entry field into which you can enter text.
- *Bitmap* creates a page that can contain a valid OS/2 bitmap.
- *Metafile* creates a page that can contain a valid OS/2 metafile.

Page attributes This group box contains additional options that you can set for the page. Checking **Chapter** makes the current page a chapter heading, creating a tab for the page in the table of contents, and enables the Tab text field so you can define the text that should be displayed on the tab.

To modify the settings for an existing page, select the page and use the **Edit** item from the context menu. The Notepad - Page Information dialog will appear and you will be able to change the same data as described for adding pages.

Since all graphics in the Notepad all bitmaps and metafiles are "view-only," you will only be able to modify the contents of text pages. In order to do this, you must double-click your left mouse button on the page to view its contents, then use the keyboard to add, change or delete text.

If you want to delete an existing page from the Notepad, use the Delete option from the context menu, or drag and drop the page to the Shredder on your desktop.

12.5.29 Configuring PIM

The PIM Preferences notebook contains all of the configuration options that you can set for every PIM component. To open this notebook, double-click your left mouse button on its icon in the IBM Works folder. OS/2 Warp 4 will display the PIM Preferences notebook as shown in Figure 514 on page 901.

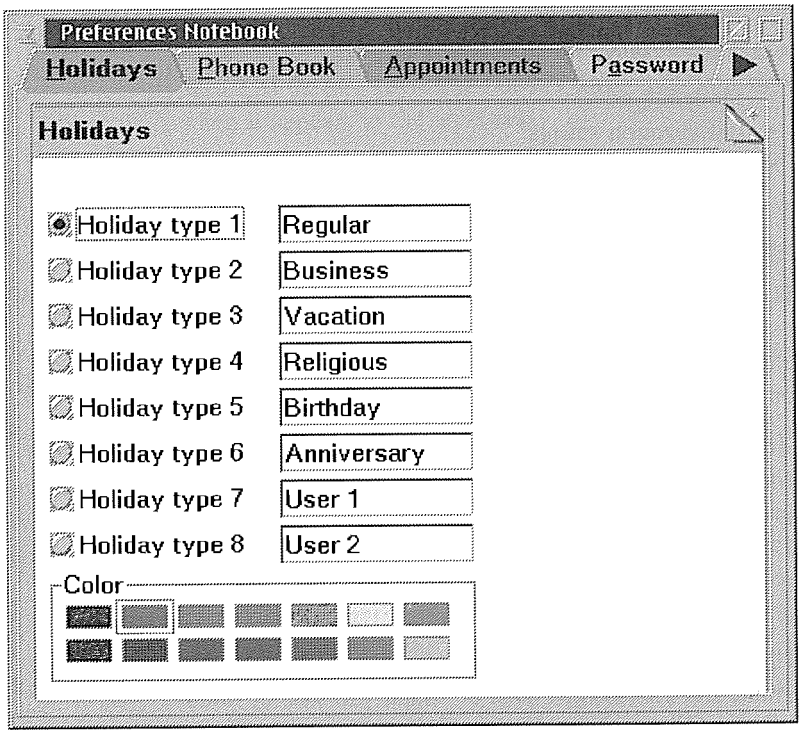

Figure 514. PIM Preferences Notebook

The following sections explain the configurable options in the PIM Preferences notebook.

12.5.30 Setting Holidays

The Holidays page allows you to customize your own set of holidays. You can assign a color and a title for each class of holiday. These colors and types will be used to denote the holiday in the To-Do List Launcher, Planner, Appointment Book and Calendar windows.

There are eight types of holidays, six of which have a default name. However, you can rename all these holidays if you wish.

12.5.31 Customizing Your Phone Book

The Phone Book tab contains four pages that enable you to set preferred options for the Phone Book notebook. These pages are:

Dialer This page contains the parameters that need to be set so that PIM can use your modem to make outgoing calls from the Phone Book notebook. You can configure the following options:

- Modem type
- Initialization strings
- Local area code

You can also use the Enable Modem check box to enable or disable use of your modem within PIM.

Custom pages These two pages provide 10 User Labels and 12 Check Labels. The user labels are used for the entry fields on the Custom pages of each entry's notebook, while the check labels are used for the check boxes on these pages.

You can use these fields and check boxes to store any information you wish. For example, you might want to gather information about the gender, income, education, marital status and hobbies of the people in your Phone Book notebook. You can enter each of these items in separate User Label fields. When you display the Phone Book notebook, these labels will appear on the page.

New Columns This page allows you to add two new columns to be displayed in the Phone Book notebook, each of which will display another type of information. These new columns can contain the following types of information:

- Title
- Primary Address Line 1
- Primary Address Line 2
- Primary Address City
- Primary Address State
- Primary Address Zip Code
- Primary Address Country
- Secondary Address Line 1
- Secondary Address Line 2
- Secondary Address City
- Secondary Address State
- Secondary Address Zip Code
- Secondary Address Country
- Notes
- Custom Fields 1 to 10

The Custom Page Tab area of the page allows you to define the tabs for Custom pages. You can also define hot-keys for these tabs by entering a tiled (~) symbol before the letter in the title that you wish to define as the hot-key. The hot-key letter will be underlined on the tab when it appears in the notebook.

12.5.32 Tailoring the Appointment Book

The Appointments page of the PIM Preferences notebook allows you to change the behavior of the Appointment Book, Planner and Year Calendar objects. The most useful of these settings are explained below.

You can set the start and end times for your normal work day. The default times are 9:00 a.m. and 5:00 p.m. respectively.

You can set the default time slot and duration for appointments. If you tend to schedule meetings that last longer or shorter than the default of 30 minutes, you can change the defaults here to avoid having to constantly make changes when scheduling appointments.

You can change the default lead time for appointment-related alarms, to make it easier to set an alarm simply by selecting the **Alarm...** button in the New Appointment or Edit Appointment windows. For example, if you normally require 30 minutes notice of an appointment, you can set this as the default, and you will not need to specify a default setting each time you set an alarm.

You can change the default "snooze time" for an alarm. When PIM displays an alarm, you have the option to cancel the alarm or to set it to "snooze," which means the alarm will repeat itself after the specified period. To change this period, alter the setting in the Alarm snooze time field.

By default, PIM keeps track of the date you are viewing in the Appointment Book, and alters the current date in the Year Calendar and To-Do List Launcher windows to match. The Track date check box allows you to turn this ability on or off.

12.5.33 Protecting Your Information - Setting a Password

The Password page allows you to control access to selected PIM features. By defining a password, you can prevent unauthorized access to your Appointment Book, Planner and Year Calendar, Phone/Address Book, To-Do List and Notepad objects.

12.5.34 General

The options provided by the Options group on this page refer to all PIM facilities. You can select the following choices:

Verify Menu Delete Choice Determines whether an alert message appears when you try to delete any information from PIM.

Overdue Event Reminder Determines whether reminder messages will appear when you open PIM, informing you of events such as overdue items in your To-Do List.

Autoload Event Monitor Causes the Event Monitor to open whenever another PIM object is opened.

12.5.35 Associating Folders with Contacts and Activities

PIM allows you to associate a Workplace Shell folder with an entry in the Phone Book notebook or the To-Do List window. You can then place objects that are related to a particular contact or task, such as documents or spreadsheets, in that folder. Whenever you open the entry in the Phone Book notebook or To-Do List window, PIM will automatically open the associated folder, giving you easy access to the objects relating to that person or task.

To associate an existing folder with an entry in the Phone Book notebook or the To-Do List window, simply drag and drop the folder over the required entry. Alternatively, you can create a new folder and automatically associate it to an entry by clicking your right mouse button to display the entry's context menu, then selecting the **Folder** item from the Open cascade menu.

12.6 Video IN

Video IN, found by clicking on **Programs=>Multimedia Presentation Manager/2**, is a set of applications and device drivers which allows you to manipulate digital video files.

When you open the **Video IN for OS/2** object located in the Multimedia folder, the Video IN Recorder dialog, shown in Figure 515 on page 905, is displayed.

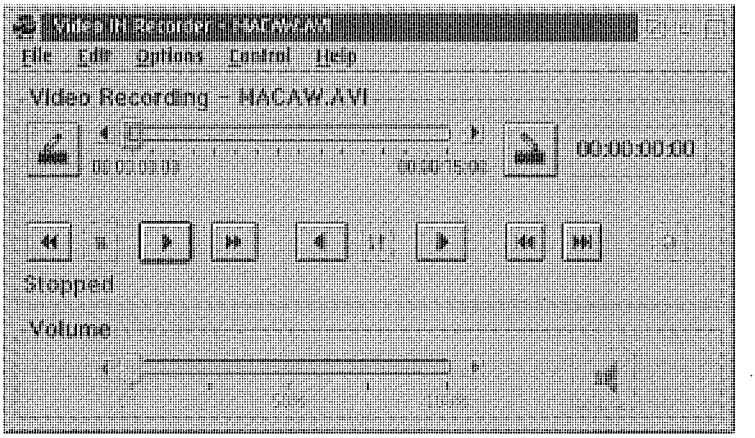

Figure 515. Video IN Recorder

You can use the Video IN Recorder to record high-quality movies for the OS/2 desktop. You can also edit digital motion videos on your computer by removing, copying and pasting frames from one movie clip into another.

In order to be able to use many of the features provided by Video IN, you will need to install an appropriate video adapter in your system. You can find in 12.6.5, "Audio and Video Capture Adapters" on page 907 a list of the supported adapters.

Video IN supports Intel's Indeo and IBM's Ultimotion video formats, using the Audio Video Interleaved (AVI) file format. Although the software motion video support in OS/2 Warp 4 allows you to play movies, it does not allow you to record and edit them. Video IN provides this capability. With Video IN, you can capture and edit video footage, and then play it back using the Digital Video provided with OS/2 Warp 4's multimedia support.

In addition to video capture, editing and playback facilities, Video IN provides new multimedia programming interfaces for developing nonlinear editors and other multimedia applications. We will not discuss the programming interfaces in this section, since the subject of programming video capture and editing applications could form an entire book! However, be aware that you can use Video IN in conjunction with OS/2 Warp 4's multimedia support to develop your editors.

12.6.1 What You Can Do

Video IN allows you to perform the following operations:

1. Record, compress and play back video footage, using a video capture adapter and any of a number of standard video compression technologies.
2. Create digital movies from bitmaps and image files, and include audio with these movies.
3. View and manipulate AVI files.

Video Compression Standards Support

Video IN includes a "pluggable" CODEC architecture, so that you can easily add support for new video compression standards as they become available.

These functions are grouped into three main areas:

1. **Software Motion Video Capture**

   You can use a digital video Media Control Driver (MCD), working in conjunction with a hardware video capture adapter, with support for different data compression types and formats.

2. **Video IN Recorder Application**

   You can create movies from bitmaps, files and video capture adapters. The recorder application allows you to invoke and control the capture/compression software to record digital motion video, and also provides editing, conversion, review capabilities and bitmap capture.

3. **AVI File Utility**

   The AVI file utility can perform operations on the Audio Video Interleaved (AVI) file. The AVI format, which is the standard format for software motion video, interleaves video and audio tracks in the file to improve access time during playback. It can do the following:

   - Create an uncompressed movie from a series of images.
   - Split the AVI file into an audio file and an AVI file without audio.
   - Merge an audio file with an AVI file.
   - View information about the AVI file.
   - Change the interleave ratio of audio and video frames.
   - Change the skew between the audio and video.

- Add and remove chunks and an index from the AVI file.

12.6.2 Hardware Requirements

Video capture and editing operations require a lot of computing power, which means that you will need a reasonably powerful computer in order to gain the most from Video IN or any other video capture software.

In this section we are giving the minimum necessary guidelines. You may require additional hardware resources if you need to do particularly specialized work.

12.6.3 Memory

IBM recommends that you have at least 6 MB of memory in your computer when using Video IN. This is fine as a minimum, but if you plan to do any serious video capture work, we recommend you install at least 12 MB of memory for good performance.

12.6.4 Disk Space

Video footage is *big*. Even with compressed video formats, a one-minute video clip will take up approximately 10 MB on your hard disk. Therefore, you will need a large hard disk if you wish to do extensive video capture and editing work.

12.6.5 Audio and Video Capture Adapters

Video IN supports a variety of video capture adapters, and also allows you to use a separate audio capture adapter, if you wish, for better sound quality.

The following is a list of the Audio Capture Adapters supported by Video IN:

- Aztech Systems Sound Galaxy Nova-16
- Creative Labs Sound Blaster
- Crystal Semiconductor ThinkPad Audio
- DSP Solutions Portable Sound Plus
- ESS Technology AudioDrive
- ESS Technology ESS-688
- IBM Audiovation Adapter
- IBM Audio Capture and Playback Adapter
- IBM Business Audio
- Media Vision Jazz 16
- Media Vision Pro AudioSpectrum 16
- Toshiba Business Audio

Audio Capture Adapter

An audio capture adapter is recommended but not required for video capture.

Video IN supports any of the following Video Capture Adapters:

- AI Tech Wavewatcher
- CEI Video Clipper
- Creative Labs Video Blaster
- Hauppauge Computer Works WinTV
- IBM Video Capture Adapter/A
- Jovian Logic QuickVIA
- Jovian Logic SuperVIA
- New Media Graphics Super Video Windows
- Omnicomp Graphics M&M Basic
- Samsung Video Magic
- Sigma Designs ReelMagic
- Sigma Designs WinMovie

New Supported Cards

Drivers allowing Video IN to support additional video capture adapters may become available as new cards are released by manufacturers. Wherever possible, IBM makes these drivers available on the Internet and on IBM bulletin board systems.

Note that different video capture adapters may have different capabilities. You can consult the following table for further details:

Table 9 (Page 1 of 2). Video IN - Supported Video Capture Adapters

Adapter	Bus	NTSC	PAL	Inputs	Overlay
VCA/A	MC	NTSC		C S R	
VCA/A	MC		PAL	C S R	
SuperVia	MC	NTSC		C S	
SuperVia	ISA	NTSC		C S	
SuperVia	ISA		PAL 1	C S	
QuickVia	ISA	NTSC		C S	

Table 9 (Page 2 of 2). Video IN - Supported Video Capture Adapters

Adapter	Bus	NTSC	PAL	Inputs	Overlay
QuickVia	ISA		PAL	C S	
QuickVia	MC	NTSC		C S	2
WinMovie	ISA	NTSC		C S	
WinMovie	ISA		PAL	C S	
WinMovie	MC		PAL	C S	2
Video Blaster	ISA	NTSC	PAL	C3	3
Video Magic	ISA	NTSC	PAL	C3	3
Super Video Windows	ISA	NTSC	PAL	C3	3
Super Video Windows	MC	NTSC	PAL	C3	4
M&M Basic	ISA	NTSC		C3 S3	
ReelMagic	ISA				5
Video Clipper	ISA	NTSC	PAL	C3	
Wavewatcher	ISA	NTSC	PAL	C3	
WinTV	ISA	NTSC		C3 S TV	

Note:

1 Card is no longer made

2 First MCA card is not yet available (should work with ISA code)

3 Card requires a VGA feature connector and VGA mode display

4 Requires a VGA mode display

5 Uses MPEG format

C Composite input

C3 Three different composite inputs

R RGB (red, green and blue) input

S S-VHS or Y/C input

S3 Three different S inputs

TV Television tuner

If you have a supported video capture adapter, you can use the following sources to create movies with Video IN:

- Videotape
- Camcorder
- Bitmap files

- AVI files using Indeo or Ultimotion formats

  AVI files are recorded with supported Video IN codes.

- Videodisc

  Video IN provides video disc support for Pioneer laser disc models LD-V4200, LD-V4300D, LD-V4400 and LD-V8000.

12.6.6 Recording Videos

After you have installed the necessary hardware, OS/2 Warp 4 and the BonusPak Video IN, you are ready to record video to your hard disk, by using one of the two available techniques:

Real-Time Recording In this technique video is captured from a playback device at normal speed.

- *Advantage:* simplicity in recording video and compatibility with a wider range of less expensive video players (such as VCRs).
- *Disadvantage:* slightly lower playback quality.

Frame-Step Recording In this technique video is captured on a frame-by-frame basis, with audio added in a subsequent step.

- *Advantage:* smoother playback and smaller file sizes.
- *Disadvantage:* it requires more advanced (and usually more expensive) playback hardware which supports frame stepping.

Let's describe these methods in more detail.

12.6.7 Real-Time Recording

Before you begin recording movies from a video camera or VCR, you need to set up Video IN for recording. You can do it as follows:

1. Click on **Programs=> Multimedia Presentation Manager/2=> Video IN Recorder**.
2. Indicate that you will record from a line device, following these steps:
   a. Select **Options** menu.
   b. Select **Device selections** option.
   c. Select **Line in** in the Video Source Device field.
3. Select the recording profile performing the following steps:
   a. Select **Options** menu.
   b. Select **Record setup** option.
   c. Select **Real-Time**.

4. Open a monitor window to view the incoming video image, as follows:
    a. Select **Options** menu.
    b. Select **Monitor video** option.
5. If you are recording from a VCR, use the VCR controls to advance the tape to the point at which you want to begin recording.
6. Cue the Video IN Recorder for recording, so that recording can begin immediately, with the following procedure.
    a. Select **Control** menu.
    b. Select **Recording** option.
    c. Select **Cue for Record** option.
7. Record your movie:
    a. Press the **Play** button on the VCR.
    b. Press **Record** to begin recording.
    c. Press **Stop** when the recording is complete.
8. After recording has finished, save the recording as a movie file, following these steps:
    a. Select **File** menu.
    b. Select **Save as** option.
    c. Type a file name with an AVI extension.

While recording, you can monitor the video and audio source in the monitor window to ensure that the correct video sequence is being captured. You can also use the video monitor to make adjustments in brightness, color, contrast and tint, which are then reflected in the recorded video clip.

You can isolate a rectangular portion of the monitor window by drawing this region directly on the monitor video window with your mouse. This is known as *image cropping*. Only the portion of the monitor window within the rectangular border will be recorded.

After recording, you can use the Video IN Recorder application to edit the video by marking regions to be cut, copied or pasted into the same video clip or other video files.

Suggestion

It is recommended that you disable the system sounds before recording video, as they can interfere with recording.

12.6.8 Frame-Step Recording

You can use the Video IN to record video clips from an existing AVI file, using the *frame-step recording* method. Recording from an existing file enables you to change some of the settings made when the file was created. You can change the compression type, maximum data rate, reference frame interval and video quality, and also decide whether or not to include an audio track in the file.

When you select an AVI digital video file as the video source, the Video IN Recorder application provides you with two groups of controls: one for managing the AVI source file and the other one for managing the video recording object. In this way, you can independently control "playing" the source video clip and recording your new video clip.

Using a file as the video source enables you to change the compression type of the data, decompress the data or compress an uncompressed file. You can select a **Compression type** or **No compression** from the Record Setup notebook and then record the file. Using this technique you can modify the following types of video data:

- Uncompressed RGB5-6-5
- Uncompressed YUV4-1-1
- Compressed IBM Ultimotion Real-Time
- Compressed IBM Ultimotion Asymmetric
- Compressed Intel Indeo 2.1 Video
- Compressed Intel Indeo R3.1 Quick
- Compressed Intel Indeo R3.1 CD-ROM

12.6.9 Capturing Bitmaps

Apart from the direct input from a video camera or VCR, and the capture from existing video clips, there is a third function that can be performed by Video IN: capture images and save them as OS/2 bitmaps. You can do it following these steps:

1. If you do not want the whole picture, select a region and mark it for cropping.
2. Select **Options** menu.
3. Select **Record setup** option.

4. Select either **Real Time** or **Frame Step** options. A settings notebook will be displayed. Under normal circumstances you do not need to change any of the information in this notebook, so simply close the notebook window.
5. Select **Bitmap Capture**.
6. Select **Capture Now**.

The Video IN Recorder will emit a beep to let you know that the image has been captured and saved. The video image is saved in OS/2 bitmap format (24-bit RGB true color).

12.6.10 Editing Sound

When you capture a video clip, the sound and the picture are actually recorded separately, and then interleaved when the file is saved in AVI format. This allows you to split audio from the video clip or merge new audio into the video clip, so that you can create silent movies or add a new sound track to modify or change the sound associated with a movie.

An ideal movie clip has one segment of video to one audio segment; this is known as a *1:1 interleave ratio*. If a movie has a 1:1 interleave ratio, the skew between audio and video segments can be changed so that the audio is stored before the corresponding video in the AVI file.

If you edit sound or add new sound to your movie clips, you should always try to maintain a 1:1 interleave ratio. This helps to ensure that your computer's audio buffers will remain full as the movie plays, and that frames are not dropped as a result of trying to maintain audio continuity.

12.6.11 Data Compression

Both Video IN and OS/2 Warp 4's software motion video use a standard Audio Video Interleaved (AVI) file format. This format arranges audio and video data in a specific way within a file, so that it can later be read by any software that supports the AVI format.

To conserve space on your hard disk, AVI data is normally compressed, and then rapidly decompressed for playback. Algorithms that do this type of compression/decompression are called CODECs. Video IN supports two of the most popular CODECs:

- Intel's Indeo
- IBM's Ultimotion

The quality of a video image depends to a large extent on the *frame rate* of the clip. The frame rate is the number of frames per second (FPS) that are captured for playback. However, the actual rate of playback depends not only on the frame rate, but also on the processing capabilities of your computer, as well as the sophistication of the CODEC used to create the movie.

One determining factor is the *data rate* of a movie. This is the number of kilobytes used by one second of the movie, and is expressed in *kilobytes per second* (*Kbps*). This value is composed of the KBs used by both audio and video. For example, a data rate of 100 KB may consist of 22 KB of audio and 78 KB of video.

Naturally, your computer should allow you to retrieve data fast enough to support the required data rate for a movie. For example, the data rate needed to play a movie recorded in 320 x 240 pixel resolution at 15 FPS with 64K colors, is approximately 150 KB. This is roughly equivalent to the maximum data rate for single-speed CD-ROM drives. You could therefore play such a movie from CD-ROM using a single-speed drive, but a higher-resolution clip (such as 640 x 480 pixel resolution) would require a faster CD-ROM drive for high-quality playback.

The relationship between frame rate and data rate is determined by the CODEC used to compress a movie. More sophisticated CODECs can compress larger amounts of data into a smaller space without sacrificing image quality. Since the decompression is done after the data is retrieved from disk or CD-ROM, a better CODEC allows you to retrieve more frames in a shorter period of time; that is, a higher frame rate for a given data rate. This results in higher playback quality.

The final determining factor in image quality is the *capture method*, which in turn depends upon the source used to record the movie in the first place. Video IN supports two different capture methods:

- Frame Step
- Real Time

They are discussed in more detail below.

12.6.12 Frame Step Capture

Frame step capture records a movie by stepping through the video source one frame at a time. This allows the CODEC to spend more time analyzing the data, and therefore you get better image quality, compression and data rates. Source input for frame step capture must be either a computer-controlled device (such as a laser disc) or any AVI file. You cannot use frame step capture when recording from a device such as a VCR

or a video camera, since the input occurs at too high a rate to permit the required analysis. In such cases, you must use real time capture instead.

However, you can use frame step capture to take an existing raw (uncompressed) AVI file, and compress it for better playback quality. Video IN allows you to compress raw AVI files, or to change the compression type of an existing compressed AVI file using frame step capture on the existing file. This capability is also useful when editing, to combine footage from movies of different types into a single file.

12.6.13 Real Time Capture

Real time capture is done from a live video source, such as a VCR or video camera. Real time capture compresses the image immediately. Since less time is spent analyzing the source, the frame size and frame rate are typically smaller, in order to achieve the same data rate as a video made using frame step compression. Real time capture is ideal for situations that require video content to be captured in real time for immediate playback.

Note that you can capture a movie from a live video source using real time capture, store it in an AVI file, and later edit the AVI file using frame step capture to provide better compression and a higher frame rate. We recommend that you do this when recording movies that you may want to keep for a long time, or for which you desire the highest playback quality.

12.6.14 Browsing Files

Video IN includes an AVI File Utility, which lets you browse and view AVI file information, manipulate the interrelation of audio and video within the AVI file and also compose an animation from a series of images.

As a file browser, the AVI File Utility allows you to view information within the file, such as the file header, ID, length, index and status. You can view all these things at once or isolate the view to just those items of your interest.

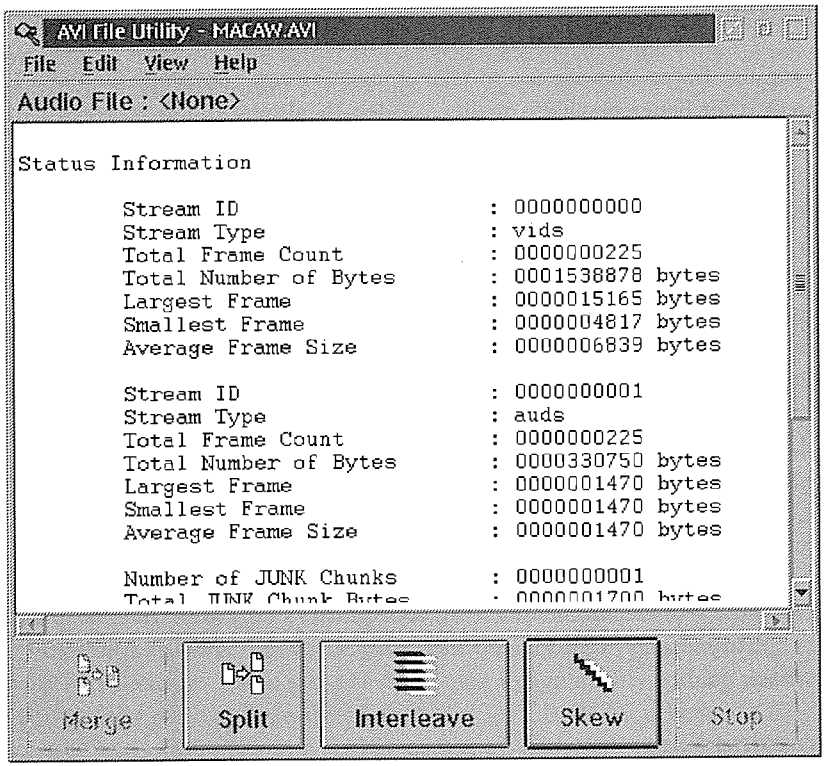

Figure 516. Video IN - AVI Status Information

In addition to file manipulation, the AVI File Utility also allows you to create raw (uncompressed) AVI movie files or animations, from a series of still images. These images need to be of equal size and can use any combination of supported image types, including the image types supported by the multimedia support in OS/2 Warp 4 or bitmaps created by using the Video IN Recorder.

To create an animation, you have to place the images and any pauses you require in the order they are to be recorded, and specify the frame rate you want. From this source information, the AVI File Utility generates a raw AVI file. If you wish, you can also add a sound track using the AVI File Utility.

You can compress this file by using it as source input for the Video IN Recorder, using frame step capture to compress the data for improved playback quality. Thus you can create a full animation sequence using bitmaps created from animation packages and/or the Video IN Recorder.

12.7 IBM Works

IBM Works provides a collection of office automation applications and personal productivity tools for users in a variety of environments, ranging from big corporations to home-based businesses and personal use. Even though these tools aren't as powerful as some commercial applications (such as the ones of Lotus SmartSuite), they meet the basic needs of users that want elaborate documents with graphics, tables and images, and also be able to integrate them through dynamic links.

IBM Works takes advantage of OS/2 Warp 4 features including 32-bit code, multi-threading, OS/2 specific controls such as notebook controls, sliders, spin buttons and value sets, as well as employing drag and drop interaction between applications.

If you click on **Programs=> Applications=> IBM Works**, the following menu will be displayed:

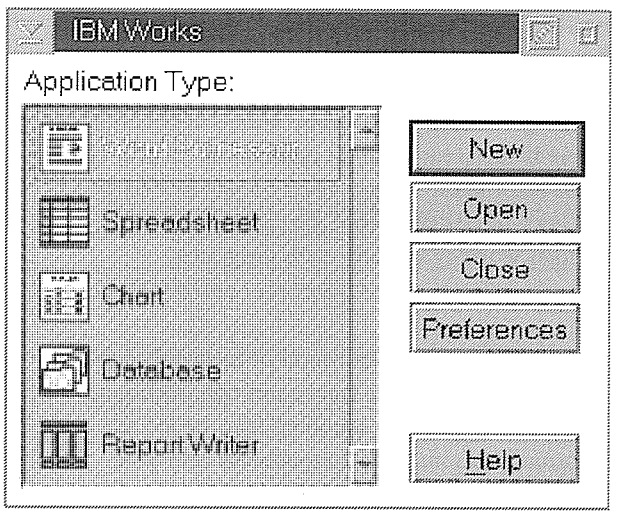

Figure 517. IBM Works - Main Menu

This menu contains the main components of IBM Works, which include:

Word Processor IBM Works includes a full-featured word processor that provides advanced functions such as tables, mail-merge printing and integrated graphics objects, in addition to all the common features found in most word processors such as multiple fonts, print-preview, the ability to define document styles, search and replace functions, page headers and footers, and more.

Spreadsheet IBM Works includes a full-function Spreadsheet utility that provides a variety of functions to meet many needs. Combine the spreadsheet capability with the word processor and chart applications, and you can produce compound documents showing text, numbers and charts on a single page.

Chart IBM Works includes a versatile charting utility that can produce a variety of chart types and lets you enhance these charts with text and drawing tools. Charts can be printed on their own or pasted/linked into other IBM Works documents.

Database IBM Works includes a powerful database application that is easy to use, can organize text and graphical information, and will import and export files in a variety of formats. The Database application is designed to work with the IBM Works Report Writer to produce customized, columnar reports.

Report Writer You can use the IBM Works Report Writer to produce columnar reports from any IBM Works Database or any dBase-compatible database.

IBM Works is a *document-centric* or *data-centric* application, where application functions are called by the data. This is different from an application-centric approach, where you first launch an application and then load your data. This fits the object-oriented philosophy of the Workplace Shell, where you manipulate objects such as documents and data files, rather than working directly with programs.

12.7.1 Word Processor

The Word Processor utility provides the basic functions found in most full-featured word processors, and allows you to quickly and easily create and edit documents and letters. You can produce high-quality documents that combine text, tables and graphics, incorporate charts and information from your spreadsheets into your documents, and also use your database information to create form letters and perform mail merges.

12.7.2 Document View Setup

You can customize the view of your document by choosing whether you want to use the tool bars and palettes shown in Figure 518 on page 919:

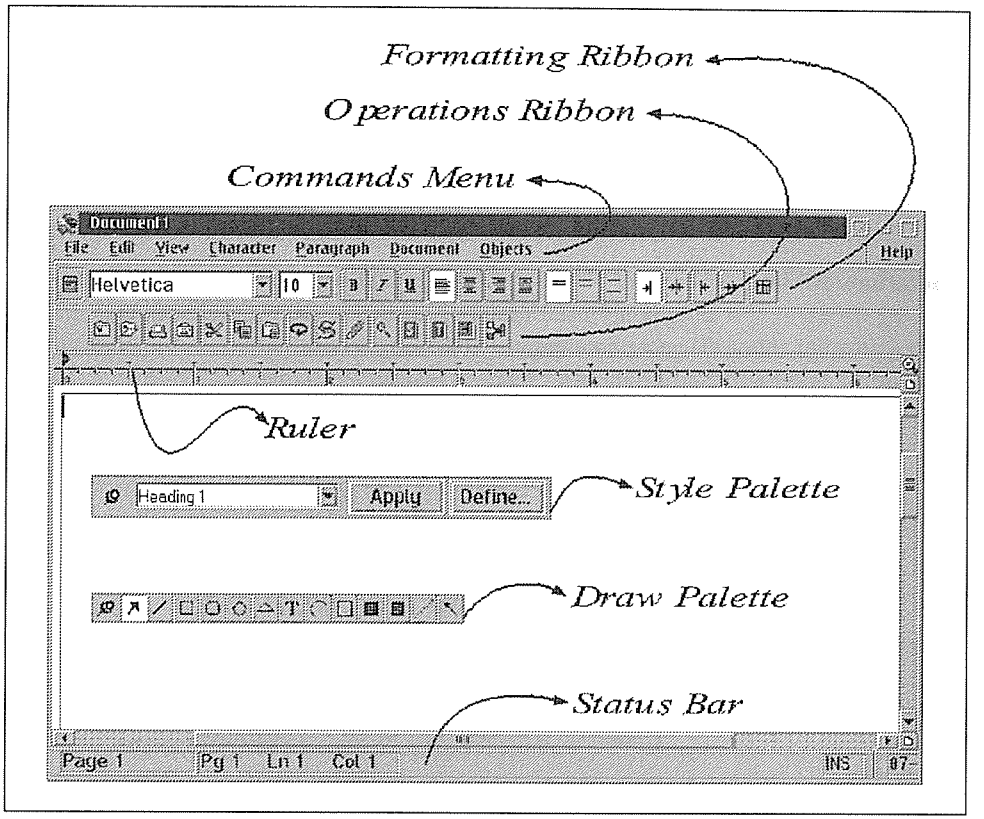

Figure 518. IBM Works - Word Processor

The Word Processor utility lets you select the following options from the View menu:

Formatting Ribbon This tool bar, also called the Word Processor Ribbon, allows you to customize the character-formatting options in the Word Processor utility, and to manage tables. The icons on the Ribbon include:

- Document Tack: allows you to drag a document to the printer
- Font Field: displays the currently selected font and lets you change it
- Point Size Field: displays the currently selected point size for the font you are using, and lets you change it
- Attribute Icons: allow you to choose bold, italic and underlined styles for your text

- Alignment Icons: allow you to choose between left, right, center or justified alignments
- Line Spacing Icons: allows you to select the number of blank lines between lines of text
- Tabs: allow you to choose one of four types of tab settings
- Table Icon: allows you to insert a table in the document

Operations Ribbon

This tool bar allows quicker and easier access to the most commonly used functions available from the Commands menu. The bar contains the following icons:

- Open: opens an existing file
- Close: closes the active IBM Works file
- Print: prints the active IBM Works file
- Send: sends the current file via cc:Mail
- Cut: cuts the current selection to the clipboard
- Copy: copies the current selection to the clipboard
- Paste: places data from the clipboard into the file
- Undelete: reverses the last delete operation
- Style Palette: activates the style palette
- Draw Palette: activates the draw palette, allowing you to insert graphics objects into your document
- Search: searches through the active file for a word or object
- Spelling: checks the spelling of the current word, selection or file
- Synonyms: looks up synonyms for the selected word
- Hyphenation: hyphenates the current word, selection or file
- Mail Merge: selects or changes the mail merge file

Style Palette

This moveable bar makes it easy to define and apply character styles. It contains a Style field that shows the current character style, and also includes Define and Apply buttons that allow you to select a character style selection for your text and apply the style.

Draw Palette This moveable bar allows you to access drawing tools and add graphics objects such as lines, rectangles, rounded rectangles, circles, triangles, text and curved lines, and also customize the appearance of these objects by selecting attributes such as fill pattern, fill color, border color, line type and arrow type.

Ruler This bar, across the top of the document window, shows the margins, indents and tab settings for the document. It is marked in the units selected under the Preferences option from the IBM Works main menu.

Status Bar This bar, at the bottom of the window, provides information about the current activity or mode in which you are working. On the left side, it describes the menu option currently selected or other status information (such as page, line and column number). On the right side, it shows the system date and indicates whether the Num Lock, Caps Lock, Scroll Lock and Insert keys are active.

Both the style and draw palettes include a "tack" that allows you to "pin" them in any place on your panel by using the mouse. You can also close these palettes by clicking twice on the tack.

12.7.3 Importing and Exporting Files

12.7.3.1 Importing Text

The Word Processor utility allows you to import text into your documents from other sources. You can import ASCII text files, or formatted files from a number of the most popular word processing packages.

To import a text file into your document:

1. Select **Import Text** from the File menu
2. Type the file name of the file you wish to import, or select the file name from the list in the dialog
3. Click on **Import**

If you are importing an unformatted text file, a dialog box appears when you select the **Import** button, prompting you to identify the character set to be used. The choices are:

- DOS characters (ASCII)
- Windows characters (ASCII)

The text from the file is then inserted at the current cursor position.

IBM Works also allows you to import text from a number of popular word processors. The supported file formats are shown in Table 10.

Table 10. Word Processor - Supported Text Formats

File Extension	Description
.LWP	IBM Works Word Processor
.RFT	Revisable Form Text/DCA
.RTF	Rich Text Format
.DOC	Word for Windows 6.0
.DOC	Word for Windows 1.x 2.x
.SAM	Ami Pro for Windows 1.x 2.0 3.0
.WP5	WordPerfect for DOS 5.x
.WP5	WordPerfect for Windows 5.x
.WP6	Unknown File Extension
.WPD	WordPerfect for DOS 6.0
.WPD	WordPerfect for Windows 6.0
.TXT	Text (DOS and Windows)

12.7.3.2 Importing Pictures

You can import graphics from other sources into your IBM Works documents, by performing the following steps:

1. Select **Import Picture** from the File menu
2. Select the file
3. Click on **Import**
4. Move the box cursor to the desired location and click your left mouse button once to place the picture

The supported types of graphic files that can be imported by the Word Processor are shown in Table 11.

Table 11 (Page 1 of 2). Word Processor - Supported Graphic Formats

File Extension	Description
.AI	Adobe Illustrator File Format
.CDR	CorelDraw Drawing File Format Version 3.0, 4.0, 5.0

Table 11 (Page 2 of 2). Word Processor - Supported Graphic Formats	
File Extension	**Description**
.CGM	Computer Graphics Metafile
.CMX	Corel (ClipArt) Format
.DIB	MS Windows Device Independent Bitmap
.DRW	Micrografix Designer Version 3.1 File Format
.DXF	AutoCAD Drawing Interchange File Format
.EPS	Encapsulated Postscript File
.GDF	IBM GDDM - Graphics Data Format
.GEM	Digital Research Graphics Environment Manager Metafile
.GIF	CompuServe Graphics Interchange Format
.HGL	Hewlett Packard Graphics Language
.IGS	Initial Graphics Exchange Specification
.JPG	Joint Photographic Experts Group Format
.MET	OS/2 Platform Metafile
.PCX	Zsoft PC Paintbrush Bitmap
.PIC	Lotus Picture File Format
.PIF	IBM Picture Interchange Format
.PNG	CompuServe PNG Extensions File Format
.PPT	Microsoft PowerPoint for Windows Version 3.0, 4.0
.RND	AutoShade Rendering File Format
.TGA	Truevision Targa Format
.TIF	Tag Image File Format
.WMF	Microsoft Windows Metafile (Win16) / Enhanced Windows Metafile (Win32)
.WPG	WordPerfect Graphic File Format Version 1.0, 2.0
.XBM	X-Windows Bitmap
.XPM	X-Windows Pixel Map
.XWD	X-Windows Dump

The Word Processor utility also allows you to paste a picture from the clipboard.

12.7.3.3 Exporting Files

You can export a text file to another application format by using the **Export** option from the File menu. The supported file types are described in Table 10.

12.7.4 Customizing Your Documents

The IBM Works Word Processor utility provides many tools that allow you to improve either the appearance or the content of your documents.

From the Character menu options you can select the fonts and the character styles that you want to use. You can also specify whether you want to use superscript or subscript characters.

From the Paragraph menu options you can insert page break, and specify the alignment, line spacing, tabs and indents to be used.

Both of these menus provide tools that allow you to customize the appearance of your documents. Most of these tools are also available from the Formatting Ribbon.

There are also some utilities, available from the Document menu, which let you improve the content of your document. You can access them by selecting the following options:

Spelling Lets you check the spelling of a single word, the selected text or the whole document. You can configure the options of the spell check utility, specifying the primary, secondary or custom dictionaries to be used and if you want to ignore the case.

When the spell check utility finds any unknown word, the Proof dialog is displayed and the unknown word is shown in the field at the top of it. If you have selected the **Always Suggest** check box, a list of suggestions will always be available. If you have not selected this option, you can select the **Suggest** button to access this list. In either case, you can then choose:

- **Replace**: to select one of the suggestions and replace the unknown word with it.
- **Skip**: to ignore the word and continue to the next unknown word.
- **Add**: to add the word to the Word Processor utility's dictionary and continue to the next unknown word.

Synonyms Allows you to find synonyms for a specific word, allowing you to replace it with any of the words in the synonym list. You can also configure the primary and secondary dictionaries to be used.

Hyphenation Allows you to hyphenate the current word, the selected text or the entire document. You can also set up options, such as the primary and secondary dictionaries to be used and the maximum

number of blank characters at the end of a line before considering hyphenating the first word on the next line.

If you check the **Confirm Changes** option in the Hyphenation dialog, you will be asked to approve each hyphenation, selecting either the **Whole** option (which leaves the word without hyphenation) or the **Split** option (which hyphenates the word at the selected hyphenation position).

Word Count Displays statistical information about the current document, such as the number of pages, words and characters.

Header and Footer These options let you configure the header and footer of your document pages, allowing you to decide if you want to omit them on the first page, the position in which you want to put the page numbers (left, center or right), the starting page number and the distance from the top or the bottom, respectively.

Page Setup Here you configure the paper size, orientation and margins for your documents.

Mail Merge Allows you to activate a database for merging with the document to produce customized letters or similar materials. The mail merge source can be either the PIM (Personal Information Manager) Phone Book or an IBM Works Database application.

Most of these options are also available from the Operations Ribbon.

12.7.5 Using Tables

The Word Processor utility allows you to operate with tables. You can create a new table simply by clicking your left mouse button on the **Table** icon in the Formatting Ribbon. You can also use the Table option from the Objects menu to select an existing table or create a new one.

You can set up your new tables from the New Table dialog, specifying:

- Columns: number of columns desired.
- Rows: number of rows desired.
- Column width: desired column width (when the Auto Column Width option is not set).
- Auto Column Width: if you enable this check box, automatic column widths are set; if you disable it, you will have to manually set the column widths.

- Free Hand: when this check box is on, you can draw a table to your own size requirements, and enter columns and rows freehand. Since you will control the size of the table, adding text *will not* automatically expand it.
- Import From: you can also insert data in the table as you create it. The supported types of data are:
  - *None:* the default, used to create an empty table
  - *Clipboard Data:* to insert tabular data from the clipboard; for instance, from the Spreadsheet application
  - *Clipboard Link:* to insert tabular data from the clipboard and have it automatically updated when the source data changes
  - *Comma Delimited:* to insert selected comma-delimited data from the document into a table
  - *Tab Delimited:* to insert selected tab-delimited data from the document into a table
  - *Paragraph:* to insert selected paragraphs into a table

12.7.6 cc:Mail It

The Word Processor utility allows you to mail your document as a cc:Mail file attachment. If IBM Works detects that cc:Mail is installed on your system, it will provide a menu item under the File menu to allow you to perform this function.

12.7.7 Getting Help

IBM Works help is available in different ways:

- You can use the Help menu options to obtain keyboard, commands, procedures, glossary and general help, as well as a guide to using the help and a description of the product.
- "Bubble help" is available for the Formatting and Operations Ribbons icons. By hovering your mouse on an item on these Ribbons, you will see a small "bubble" describing the function of each item. This form of online help is also available for the icons down the right side of the document.

URL Support

IBM Works has the ability to launch the WebExplorer. If you have an Internet communication application on your machine, IBM Works will launch it.

12.7.8 Spreadsheet

The IBM Works Spreadsheet application provides the basic functions of most popular spreadsheet programs, allowing you to enter text, numbers and formulas, and perform operations or obtain charts based on them. A spreadsheet can be a maximum of 768 columns by 1024 rows in size.

The Spreadsheet utility includes built-in functions that provide shortcuts to complicated formulas. As the default mode of IBM Works is automatic recalculation, calculated cells are updated whenever you change the data in the spreadsheet. If you set this calculation option off, you will have to manually choose to recalculate your spreadsheet values after each modification.

You can also link data from a spreadsheet to a chart or a table in the Word Processor utility. When you do this, any data modifications that you perform in your spreadsheet will automatically be reflected in the chart and/or document.

12.7.9 Spreadsheet View Setup

Figure 519 on page 928 shows a typical spreadsheet with all the tool bars enabled. You can customize this view by selecting which palettes and Ribbons you want to use.

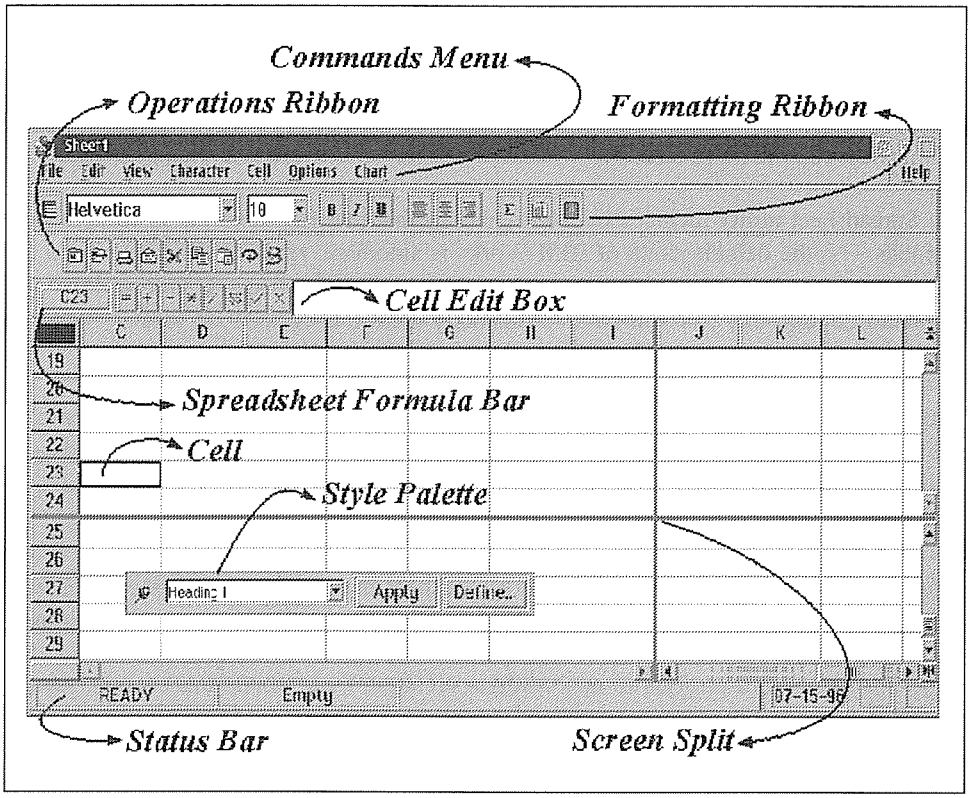

Figure 519. IBM Works - Spreadsheet

The Spreadsheet application allows you to select the following options from the View menu:

Formatting Ribbon This tool bar, also called the Spreadsheet tool bar, allows you to customize the character formatting in your spreadsheets, and provides you with quick and easy access to the Sum, Chart and Shade icons. This Ribbon includes the following icons:

- Document Tack: allows you to drag the current spreadsheet document to the printer
- Font Field: displays the currently selected font and lets you change it
- Point Size Field: displays the point size for the currently selected font, and lets you change it.
- Attribute Icons: allow you to choose bold, italic and underline options

- Alignment Icons: allow you to choose between left, right, center or justified alignment
- Sum (Sigma) Icon: inserts the sum function in the cell edit box
- Chart Icon: lets you draw a chart. If a group of cells within the spreadsheet has been selected, this icon activates a cross-hair cursor with which you can define the area on the spreadsheet in which to draw a chart of the data. Otherwise, it displays the New Chart dialog so that you can create a chart
- Shade Icon: applies to the currently selected cells the last shade style selected in the Border dialog.

Operations Ribbon This tool bar gives you quick and easy access to the most commonly used functions available from the Commands menu. The bar contains the following icons:

- Open: opens an existing file
- Close: closes the active IBM Works file
- Print: prints the active IBM Works file
- Send: sends the current file via cc:Mail
- Cut: cuts the current selection to the clipboard
- Copy: copies the current selection to the clipboard
- Paste: places data from the clipboard into the file
- Undo: reverses the last edit operation
- Style Palette: toggles the visibility of the style palette

Style Palette This moveable bar makes it easier to define and apply character styles. It has a Style field that shows the current character style, and also has Define and Apply buttons to make the character style selection for your text and apply the changes, respectively. It includes a "tack" that allows you to "pin" it in any place on your panel just by using the mouse. You can also close this palette by clicking twice on the tack.

Status Bar This bar, at the bottom of the window, provides information about the current activity or mode. On the left side, it describes the menu option currently selected or other status information (such as the type of data of the cell or the status of the

spreadsheet). On the right side, it shows whether Num Lock, Caps Lock and Scroll Lock keys are active.

Split This option splits the spreadsheet window into panes, horizontally and/or vertically.

Freeze When the spreadsheet window is split into panes using the Split option, the Freeze option causes the upper vertical scroll bar (if there is one) and the left horizontal scroll bar (if there is one) to be removed, so that only one of the panes can be scrolled in all directions and the others are forced to scroll with it.

The IBM Works Spreadsheet utility also includes a Spreadsheet Formula bar that provides you with quick access to the most commonly used spreadsheet operations. This bar consists of:

- Active Cell Button: displays the address of the active cell. When pressed, this button scrolls that cell into view. When a chart is selected, it displays the number of charts in the spreadsheet.
- Mathematical Operators: these insert mathematical operator characters: =, +, -, * and / into the Cell Edit Box. The "=" button should be used to begin entering a formula.
- $$ (Absolute) Icon: inserts absolute cell referencing into the formula being built in the Cell Edit Box. This icon cycles through four forms of cell addressing:

  Relative (for example, A1)
  Absolute (for example, A1)
  Mixed (for example, $A1 or A$1)

- Check Mark or Accept Icon: enters the current contents of the Cell Edit Box as the new cell entry. It has the same effect as pressing the Enter key or an arrow key.
- X or Cancel Icon: ignores the contents of the Cell Edit Box and retains the original cell entry. This has the same effect as pressing the Esc key while editing a cell.

The Cell Edit Box is the entry area where labels, values and formulas appear when they are first typed. The data can be up to 255 characters in length.

12.7.10 Using Functions

The IBM Works Spreadsheet application allows you to use functions, frequently performed calculations that are built into the spreadsheet, as shortcuts for complicated formulas.

To enter a function, you should select the cell to contain it and enter "=" to begin the formula. You can then enter the name of the function, and insert cell references into the function by typing or by selecting ranges of cells with your mouse.

You can also click the **Paste Function** option from the Edit menu to enter a function. In this case, when you select one of the function category buttons, the associated functions list will be displayed so that you can choose the desired function. Select the **Paste** button, and the function will appear in the Cell Edit Box at the insertion point. Finally, you can insert references by typing them directly into the cell, or by selecting ranges of cells with your mouse

IBM Works Spreadsheet utility provides 54 functions, classified into eight major categories:

1. Text Functions
2. Logical Functions
3. Date Functions
4. Trigonometric Functions
5. Financial Functions
6. Time Functions
7. Statistical Functions
8. Table Lookup Functions

All of these functions have the same basic syntax; the function name is followed by a set of parentheses within which are one or more arguments separated by commas. Table 12 contains a short description of each function.

Table 12 (Page 1 of 6). Spreadsheet Functions

Name	Description	Syntax
TEXT FUNCTIONS		
Find	Returns character position of first occurrence of specified text within a string.	FIND(text,string,startchar)
Fixed	Converts a numeric value to a character string.	FIXED(values,decimals)
Left	Returns the leftmost characters from a string.	LEFT(text,nchar)
Len	Returns the number of characters in text.	LEN(text)
Mid	Returns specified number of characters from text beginning with the character at startnum.	MID(text,startnum,nchars)

Table 12 (Page 2 of 6). Spreadsheet Functions

Name	Description	Syntax
Rept	Returns a character string consisting of a specified number of repetitions of text.	REPT(text,ntimes)
Search	Searches for text string in text beginning at the start number. Unlike Find, does not look for an exact match on the case of characters and allows use of * and ? wildcards.	SEARCH(findtext,intext,startnum)
String	Converts a numeric value to a character string.	STRING(val,numdec)
Trim	Removes leading and trailing spaces from text string.	TRIM(text)
Upper	Converts character string to upper case.	UPPER(text)
LOGICAL FUNCTIONS		
And	Returns the logical value true if all argument values in list are true (for example, non-zero). Otherwise, returns false.	AND(logical1,logical2,...)
False	Returns the logical value false.	FALSE()
If	If logical test is true, returns first value following the logical condition. Otherwise, returns second value following logical condition.	IF(test,trueval,falseval)
NA	Returns N/A which means there is no value available.	NA()
Not	Reverses the value of the logical.	NOT(logical)
Or	Returns the logical value true if any value in list is true. Otherwise, it returns false.	OR(logical1,logical2,...)
True	Returns the logical value true.	TRUE()
DATE FUNCTIONS		
Date	Returns the serial number corresponding to the year, month and day.	DATE(yr,mon,day)
Date value	Converts date text to a serial number.	DATEVALUE(datetext)
Day	Returns calendar day of the month corresponding to a specific serial number.	DAY(number)

Table 12 (Page 3 of 6). Spreadsheet Functions

Name	Description	Syntax
Month	Returns month corresponding to a specific serial number.	MONTH(number)
Now	Returns serial number for current system date and time.	NOW()
Weekday	Returns integer number for the day of week corresponding to the serial number. Sunday is day 1.	WEEKDAY(number)
Year	Returns year corresponding to a specific serial number. The year will be returned as an integer between 1900 and 2078 since the IBM Works calendar begins January 1, 1900 and ends December 31, 2078.	YEAR(number)
TIME FUNCTIONS		
Hour	Returns the hour for specific serial number. Hour will be an integer ranging from 0 (24:00) to 23 (23:00).	HOUR(number)
Minute	Returns the minute for specified serial number. Minute will be an integer ranging from 0 to 59.	MINUTE(number)
Now	Returns serial number for current system date and time.	NOW()
Second	Returns the second for specified serial number. Second will be an integer ranging from 0 to 59.	SECOND(number)
Time	Returns the serial number for the specified time.	TIME(hr,min,sec)
Time value	Converts time text to a serial number.	TIMEVALUE(timetext)
STATISTICAL FUNCTIONS		
Avg	Returns the average of the arguments.	AVERAGE(num1,num2,...)
Count	Counts the numbers in the list of arguments.	COUNT(val1,val2,...)
Max	Returns the largest number in the list of arguments.	MAX(num1,num2,...)
Min	Returns the smallest number in the list of arguments.	MIN(num1,num2,...)
Sqrt	Returns the square root for a positive number. If the number is negative, it will return NUM!	SQRT(number)

Table 12 (Page 4 of 6). Spreadsheet Functions

Name	Description	Syntax
Stdev	Estimates the standard deviation of a sample population based on values in the argument list.	STDEV(num1,num2,...)
Stdevp	Estimates the standard deviation of an entire population based on values in the argument list.	STDEV(num1,num2,...)
Sum	Adds all the numbers in the list of arguments and returns the sum.	SUM(num1,num2,...)
Var	Calculates the variance of a sample population based on values in the argument list.	VAR(num1,num2,...)
Varp	Calculates the variance for an entire population based on the list of arguments.	VARP(num1,num2,...)
TABLE LOOKUP FUNCTIONS		
Hlookup	Searches the first row of a table, which must be in ascending order, for a value. The function returns the contents of the cell in row *rownum* of the table, in the same column as the matching value. If the exact value is not found, the function returns the largest entry that is less than the specified value.	HLOOKUP(value,table,rownum)
Vlookup	Searches the first column of a table, which must be in ascending order, for a value. The function returns the contents of the cell in column *column* of the table in the same row as the matching value. If the exact value is not found, the function returns the largest entry that is less than the specified value.	VLOOKUP(value,table,column)
TRIGONOMETRIC FUNCTIONS		
Acos	Arccosine of a number.	ACOS(number)
Asin	Arcsine of a number.	ASIN(number)
Atan	Arctangent of a number.	ATAN(number)
Cos	Cosine of a number.	COS(number)
Degrees	Converts from radians to degrees.	DEGREES(number)
PI	Returns the constant 3.14159... accurate to 14 decimal places.	PI()

Table 12 (Page 5 of 6). Spreadsheet Functions		
Name	**Description**	**Syntax**
Radians	Converts from degrees to radians.	RADIANS(number)
Sin	Sine of a number.	SIN(number)
Tan	Tangent of a number.	TAN(number)
FINANCIAL FUNCTIONS		
Depre-ciation (DDB)	Returns the double declining balance depreciation based on the purchase price of the item, its salvage value, useful life and period of time for which the amount of depreciation is needed.	DDB (cost, salvage, life, period)
Annuity (FV)	Returns the future value of an annuity financed by constant payment amounts (pmt) invested for a certain number of periods (nper) at a particular interest rate. Optionally, you can enter the present value (pv) of the payments, and the type. If omitted, the present value is assumed to be 0. The type indicates whether payments are due at the end of the period or at the beginning of the period. The default is 0 for end of period; enter 1 for beginning of period.	FV(rate,nper,pmt,pv,type)
Internal Rate of Return (IRR)	Returns the internal rate of return for a series of cash values as represented in a cell range. Values must be expressed as a range of cells and must include at least one positive and one negative value. You can supply a realistic guess for the discount rate or IRR will guess in the range .1% to 10%.	IRR(values,guess)
Netval (NPV)	Using a constant rate, returns the present value of future cash flows represented by the list of values. A series of up to 14 values may be used.	NPV(rate,value1,value2,...)

Table 12 (Page 6 of 6). Spreadsheet Functions		
Name	**Description**	**Syntax**
Payment (PMT)	Determines the payment amount that would need to be paid in each of a specified number of periods (nper) to pay back an initial investment (loan) or amount pv at a constant interest rate. Optionally, the user can enter a specified cash balance future value (fv) at the end of nper periods, and the type. If omitted, future value is assumed to be 0. The type indicates whether payments are due at the end of the period or at the beginning of the period. The default is 0 for end of period; enter 1 for beginning of period.	PMT(rate,nper,pv,fv,type)

12.7.11 Importing and Exporting Files

12.7.11.1 Importing Cells

The IBM Works Spreadsheet utility allows you to import data from a number of popular spreadsheet packages by clicking on **Import Cells** in the File menu. The supported file formats are shown in Table 13.

Table 13. Spreadsheet - Supported File Formats	
File Extension	**Description**
.LSS	IBM Works Spreadsheet
.XLS	Microsoft Excel 1.0, 2.0
.WKS	Lotus 1-2-3 version 1a
.WK1	Lotus 1-2-3 version 2
.CSV	Comma Separated Values
.TSV	Tab Separated Values

If you want to import a spreadsheet from a later version of Excel than those supported by IBM Works, you should first save the file using the format from an earlier version of Excel, then import it to the IBM Works Spreadsheet application.

12.7.11.2 Exporting Files

You can export a spreadsheet to another spreadsheet format, by clicking the **File Export** option from the File menu. The supported file types are the same as the ones

listed in Table 13, except that IBM Works does not allow you to export files in Microsoft Excel format.

12.7.12 Creating Charts from Spreadsheet Data

You can create charts based on the data in a spreadsheet, either by clicking on the **Chart** icon on the Formatting Ribbon or by selecting **New Chart** option from the Chart menu.

If you have not marked an area of the spreadsheet to be charted, a New Chart dialog will be displayed, asking you to define the Data Series Name, Labels, Series Name and Cells. These fields define the data that you will put in your chart.

When you have defined these attributes, a cross-hair cursor will be displayed. Click this cursor on the cell where you want to place the top left corner of the chart to be placed, and drag it to the cell where you want to place the bottom right corner. IBM Works will create and display the chart object.

If you double-click your mouse on the chart object, IBM Works will display a Chart window, allowing you to perform all the operations described in 12.7.15, "Chart" on page 938. You can also display a pop-up menu for the chart object by clicking your right mouse button over it. From this menu, you can access the object properties, or copy and clear the chart. You can also discard the chart object by first selecting it, then choosing the **Clear** option from the Edit menu or clicking the **Del** key.

12.7.13 Formatting Data in Cells

The IBM Works Spreadsheet utility allows you to change the format and presentation of the cells in your spreadsheet, using the options available from the Cell menu. You can:

- Select number, date and time formats
- Define custom formats (numeric, currency, date and time)
- Select color for negative numbers
- Add or remove thousands punctuation
- Select text alignment:

  General: aligns text on left and numbers on right
  Left: aligns cell data on left
  Center: centers cell data
  Right: aligns cell data on right

- Select cell borders, row height and column width

- Protect or unprotected a range of cells

You can also find a number of items in the Options menu that allow you to perform operations on the data in the cells of your spreadsheet. For example, you can select the **Sort** option to sort the entire spreadsheet or a selected range of cells by row or column, alphabetically or numerically, in either ascending or descending order.

From the Display option of this menu, IBM Works allows you to set up the display of your spreadsheet, by selecting:

- **Grid**: you can choose whether to display the cell boundary lines on the panel.
- **Zero Values**: when checked, cells containing zero values are displayed and printed with zeros. Otherwise, these cells are blank.
- **Display Formula:** when enabled, displays and prints the formula in a cell rather than its resulting value.

You can also locate any cells that contain circular references (that is, cause a formula to refer back to itself) by selecting the **Find Circular** option from this menu.

12.7.14 Getting Help

Help for the IBM Works Spreadsheet utility is available in the same ways as described in 12.7.7, "Getting Help" on page 926.

REXX Support

The IBM Works Spreadsheet utility allows users to evaluate their own functions through the REXX scripting facility. They can write a function, external to the Spreadsheet application, and have the value returned after the execution of a REXX function. The facility allows users to choose from several provided scripts or to write their own.

12.7.15 Chart

The IBM Works Chart utility allows you to represent numeric data in numeric format using a variety of chart types, and to enhance your charts with text and drawing tools. It also lets you paste or link charts with other IBM Works documents. You can use data from the IBM Works Spreadsheet utility, paste data from a report or word processor table, or enter data directly into the Chart utility. The Chart utility also accepts from the Spreadsheet application using the Paste Link option, so that your chart will automatically be updated whenever you change data values in the spreadsheet.

The IBM Works Chart application provides eight different kind of charts, as shown in Figure 520 on page 939.

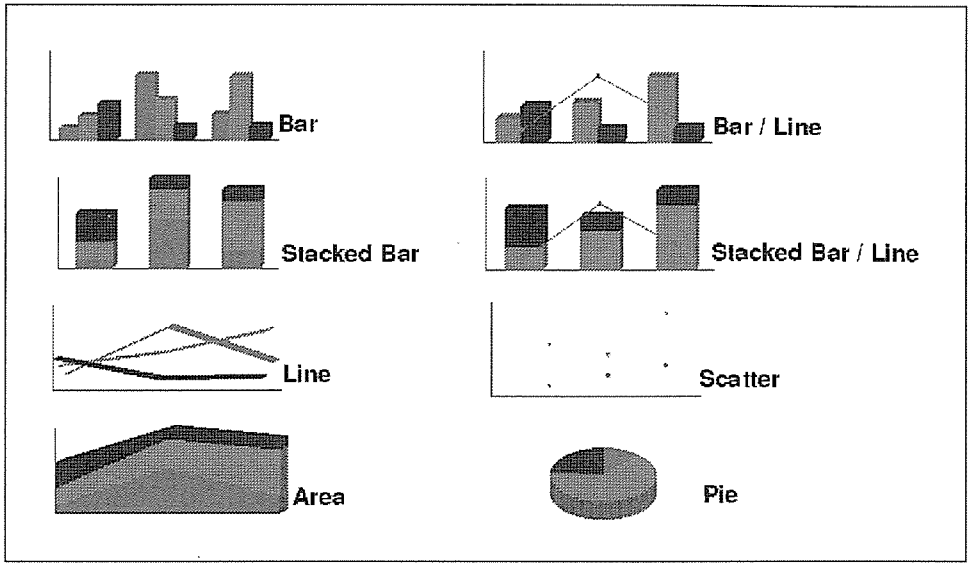

Figure 520. IBM Works - Chart Types

12.7.16 Chart View Setup

You can customize the Chart View in the same way as you do with the Word Processor and the Spreadsheet applications, according to your needs. The tool bars available for the Chart application are shown in Figure 521 on page 940.

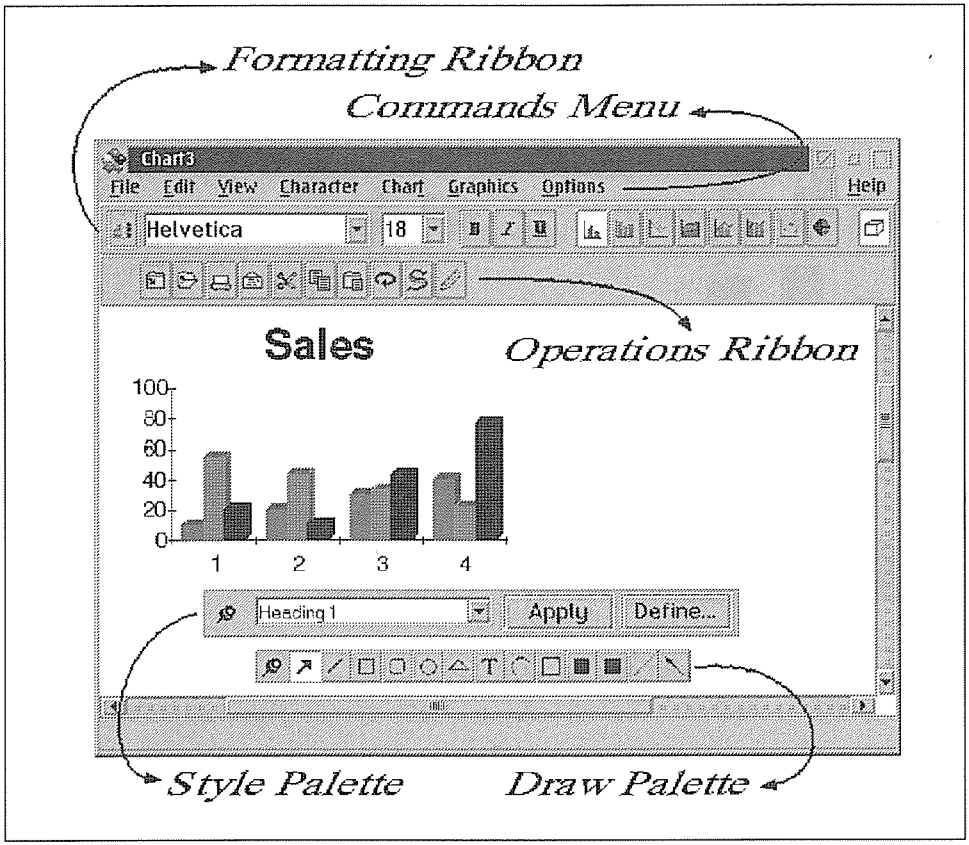

Figure 521. IBM Works - Chart Types

The Chart utility lets you select the following options from the View menu:

Formatting Ribbon This tool bar, also called the Chart Ribbon, allows you to customize the character formatting and manage chart types. The set of formatting icons include:

- Document Tack: allows you to drag the current document to the printer.
- Font Field: displays the currently selected font and lets you change it.
- Point Size Field: displays the point size of the currently selected font, and lets you change it.
- Attribute Icons: allow you to choose bold, italic and underline options.

- Chart Type Icons: let you choose one of the eight available chart types.
- Dimension Icon: toggles the chart between 2D and 3D modes.

Operations Ribbon This tool bar allows a quicker and easier access to the most commonly used functions available from the Commands menu. The bar contains the following icons:

- Open: opens an existing file
- Close: closes the active IBM Works file
- Print: prints the active IBM Works file
- Send: sends the current file via cc:Mail
- Cut: cuts the current selection to the clipboard
- Copy: copies the current selection to the clipboard
- Paste: places data from the clipboard into the file
- Undelete: reverses the last delete
- Style Palette: activates the style palette
- Draw Palette: activates the draw palette

Style Palette This moveable bar makes it easier to define and apply character styles. It has a Style field that shows the current character style, and also contains Define and Apply buttons that allow you to select the character style for your text and apply the changes.

Draw Palette This moveable bar allows you to add graphic objects such as lines, rectangles, rounded rectangles, circles, triangles, text and curved lines, and also to customize the appearance of these objects, selecting attributes such as fill pattern, fill color, border color, line type and arrow type.

Status Bar This bar, at the bottom of the window, provides information about the current activity or mode in which you are working. On the left side, it describes the menu option currently selected or other status information. On the right side, it shows the system date and indicates whether the Num Lock, Caps Lock and Scroll Lock keys are active.

12.7.17 Importing Pictures

Like most components of IBM Works, the Chart tool allows you to import files from other packages, by using the Import Picture option from the File menu.

The graphics file formats supported by the Chart tool are shown in Table 14.

Table 14 (Page 1 of 2). Chart - Supported Graphic Formats

File Extension	Description
.AI	Adobe Illustrator File Format
.CDR	CorelDraw Drawing File Format
.CGM	Computer Graphics Metafile
.CMX	Corel (ClipArt) Format
.DIB	Microsoft Windows Device Independent Bitmap
.DRW	Micrografix Designer Version 3.1 File Format
.DXF	AutoCAD Drawing Interchange File Format
.EPS	Encapsulated Postscript File
.GDF	IBM GDDM - Graphics Data Format
.GEM	Digital Research GEM Metafile
.GIF	CompuServe Graphics Interchange Format
.HGL	Hewlett Packard Graphics Language
.IGS	Initial Graphics Exchange Specification
.JPG	Joint Photographic Experts Group Format
.MET	OS/2 Platform Metafile
.PCX	Zsoft PC Paintbrush Bitmap
.PIC	Lotus Picture File Format
.PIF	IBM Picture Interchange Format
.PNG	CompuServe PNG Extensions File Format
.PPT	Microsoft PowerPoint for Windows
.RND	AutoShade Rendering File Format
.TGA	Truevision Targa Format
.TIF	Tag Image File Format
.WMF	Microsoft Windows Metafile
.WPG	WordPerfect Graphic File Format
.XBM	X-Windows Bitmap
.XPM	X-Windows Pixel Map

Table 14 (Page 2 of 2). Chart - Supported Graphic Formats	
File Extension	**Description**
.XWD	X-Windows Dump

12.7.18 Creating Charts

The Chart utility allows you to create a new chart by selecting the **Chart** option from the IBM Works main menu, and then clicking on the **New** button. The Data Input dialog will be displayed. This is where the data for your chart should be entered.

You can enter up to eight labels for the legends in the Label column at the left of the dialog. You can also enter the labels for the points on the X axis in the Label row at the top of the dialog. For pie charts, these are the labels for the slices.

The numerical data for each data series and X axis point should be entered in the edit box rows. You can use the horizontal scroll bar to enter up to 60 sets of data.

The Data Input dialog also provides buttons that allow you to:

- *Suppress:* keep the selected column or row from showing on the chart.
- *Cut:* remove the selected data from the chart and place it on the clipboard.
- *Copy:* copy the selected data onto the clipboard.
- *Paste:* paste the contents of the clipboard into the dialog.
- *Save:* save the settings and return to the chart.

You can also create new charts by clicking the **Data Input** option from the Chart menu.

Once you have created the chart, you can incorporate it into the Word Processor or the Spreadsheet applications, simply by dragging and dropping the chart into your document or spreadsheet.

12.7.19 Getting Help

The Chart tool provides help in the same ways as both of the IBM Works components previously described, as explained in 12.7.7, "Getting Help" on page 926.

12.7.20 Personal Information Manager

The Personal Information Manager (PIM) , found by clicking on **Programs=> Applications=> IBM Works**, provides a collection of productivity tools that allow you to easily manage personal information such as appointments, contacts, phone numbers, etc. PIM provides you with tools to:

- Manage your appointments on a daily, monthly and/or yearly basis using the Appointment Book, Planner and Year Calendar objects
- Keep track of important tasks with the To-Do List object
- Maintain your contacts with the Phone/Address Book and Contact List objects
- Keep notes with the Notepad object
- Remind you of important events with the Event Monitor utility

PIM is part of IBM Works, and the Workplace Shell objects used by PIM reside in the IBM Works folder. This folder itself resides in the Applications folder within the Programs folder on your Workplace Shell desktop.

This section gives a short description of the main features of these applications, and how to take advantage of them.

12.7.21 Database

The IBM Works Database application allows you to create databases for organizing and storing information.

12.7.22 Database Modes

The Database tool provides two modes of operation:

- Forms Design mode
- Data Entry/Query mode

The first time you create a form, you are automatically taken into design mode. This mode allows you to design the panel layout and determine the fields of your database.

After you have designed the form of the database and saved it, you can select the database and it will open in data entry mode. You can switch between Form Design and Data Entry mode by clicking your left mouse button on the **Form** or **Data** icons from the Database or Formatting Ribbons.

12.7.22.1 Form Design Mode

In Form Design mode, you define what data is to be stored and how it will appear when displayed on the panel. Form design involves creating the layout of the form as well as specifying the name, data type and width for each field. Optionally, you can describe field defaults and verification conditions.

12.7.22.2 Data Entry/Query Mode

In Data Entry/Query mode, you can enter data into your database, and query existing data using the form you have designed while in Form Design mode.

After creating a data form and entering data, you can modify the form to add, delete or change fields. It is better to make modifications to the form before entering a large amount of data, since modifying the form once data has been entered may result in a lengthy reorganization of your database.

12.7.23 Using the Tool Bars

As with the IBM Works components already described, the Database application provides tool bars that allow you to quickly and easily access a variety of functions provided by this utility. The difference between these other components and the Database application is that some of these tool bars may change, depending on the mode that you are using, as shown in Figure 522 and Figure 523 on page 946.

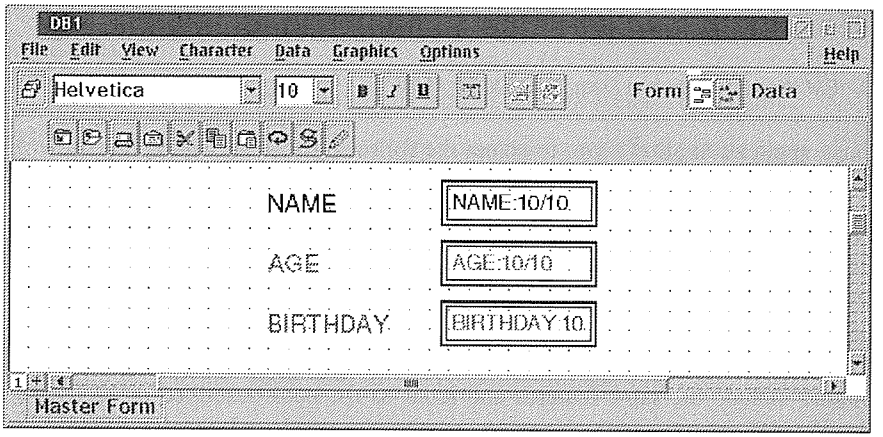

Figure 522. IBM Works - Database Form Design Mode

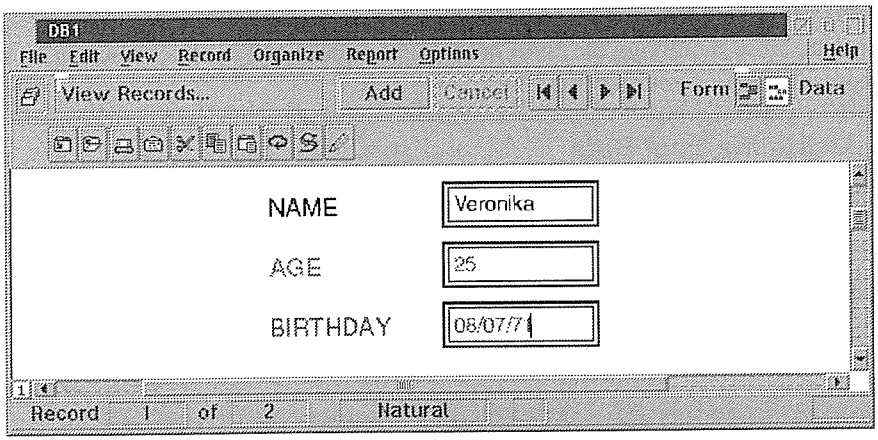

Figure 523. IBM Works - Database Data Entry/Query Mode

The Database application allows you to select the following tool bars from the View menu:

- **Operations Ribbon**
- **Style Palette**
- **Draw Palette**
- **Status Bar**

These tool bars include the same features and icons as the ones described in 12.7.16, "Chart View Setup" on page 939. However, as already mentioned, there are also some tool bars within the Database utility that change according to the mode you are currently using. One of these is the Formatting Ribbon.

When the Form Design mode is activated, this tool bar is also called the Database Form Ribbon and includes the following icons:

- Document Tack: allows you to drag the document to the printer
- Font Field: displays the currently selected font and lets you change it
- Point Size Field: displays the point size for the currently selected font and lets you change it
- Attribute Icons: allow you to choose bold, italic and underline options
- Insert Field Icon: allows you to insert a data field on the data form
- Group/Ungroup Icons: let you group or ungroup fields or objects on the form

- Form/Data Icons: let you switch between Forms Design and Data Entry modes

When the Data Entry/Query mode is activated, this tool bar is also called the Database Ribbon, and includes the following icons:

- Document Tack: allows you to drag the document to the printer.
- View Records: this display indicates that you are in View Records mode. The possible modes are:

  Add Record
  Modify Records
  View Records
  View Selected Records

- Add Button: displays a blank record so that you can add information to the database.
- Cancel Button: aborts the current Add or Modify Record procedure.
- Record Navigation Icons: these are four icons that allow you to jump to different records in the file. From left to right, they move to the:

  First record
  Previous record
  Next record
  Last record

- Form/Data Icons: allow you to switch between Data Entry and Forms Design modes.

The Commands Menu also changes according to the mode in use. When the Form Design mode is enabled, this tool bar contains the following menus:

File This menu includes options for opening, saving and closing files, using keyboard macros, switching to Data Entry mode, importing pictures and printing.

Edit This menu contains the typical editing options such as cut, copy, paste and delete/undelete, as well as options for setting the properties of the form's objects, grouping or ungrouping them, and moving them to the front or back.

View From this menu you can activate the tool bars with which you want to work.

Character The options on this menu allow you to define and apply character styles. The same functions are provided by the style palette.

Data From this menu you can insert a new data field into your form, or edit the definition of an existing field.

Graphics This menu provides drawing tools and includes options that allow you to customize the appearance of the objects of your form. The same functions are available from the draw palette.

Options The options of this menu allow you to establish page, alignment and grid settings, as well as define the data entry tab order.

Help This menu provides help options related to all the features provided by the Database application and other IBM Works components.

On the other hand, when Data Entry/Query mode is selected, the following menus are provided by the Commands tool bar:

File As in Forms Design mode, this menu contains options for opening, saving and closing files, using keyboard macros, importing pictures and printing. However, it also contains additional options that allow you to import and export files, and to switch to Forms Design mode.

Edit The options in this menu let you perform cut, copy and paste operations, as well as delete the current selection or reverse the last delete. This menu also includes an option that allows you to copy the previous record into the current one.

View From this menu you can enable or disable the Status Bar and the Formatting and Operations Ribbons.

Record This menu includes options that allow you to:

- Move to the first, next, previous or last record.
- Add or delete a record.
- Define fields to update.
- Define the record select criteria.
- Move to a specific record.
- Restore a deleted record.

Organize The options provided by this menu let you:

- Use the current sort criteria.
- Use the currently selected index.
- Change the sort criteria.
- Create an index.
- Select or edit an existing index.

Report From this menu you can launch the Report Writer to create a new report or open an existing one, as well as obtain a list view of the active database.

Options The options of this menu allow you to:

- Display statistics on the current database.
- Suppress the displaying pictures.
- Show the records marked for deletion and delete them from the database.
- Add, delete or go to a specific page.

Help The same as in Form Design mode, this menu provides help options related to all the features provided by either the Database utility or the other IBM Works components.

12.7.24 Importing and Exporting Files

12.7.24.1 Importing Pictures

You can import a picture into a data form or database by using the **Import Picture** option from the File menu.

The IBM Works Database allows to import the same types of graphic files as the Word Processor utility, as listed in Table 11 on page 922.

12.7.24.2 Importing Data

The IBM Works Database allows you to add information to your database by importing a previously created database file. To insert records from another database, select the **Import Data File** option from the File menu. This option is only available when you are in Data Entry mode.

The supported data file formats are shown in Table 15.

Table 15. Database - Supported File Formats

File Extension	Description
.DBF	dBASE IV Database
.LDB	Data Filer Database
.CSV	Comma Separated Values
.TSV	Tab Separated Values
.DEL	Database Manager Delimited

If you are importing a .DBF or .LDB file, a dialog will appear allowing you to choose how the fields are to be matched. The available options are:

Matching by field names Only data with exactly the same field names as those in the current form will be imported.

Matching by field order Imports the contents of field 1 of the import file into field 1 of the form, and so on until the fields in the form have been filled or there are no fields remaining in the import file. This is done for each record in the import file.

12.7.24.3 Exporting Data

You can export data from an IBM Works database to another file format by clicking the **Export** option from the File menu. This option is available only if you are working in Data Entry mode.

The IBM Works Database allows you to export files to all the file formats listed in Table 15 on page 949, except for the .DEL file type.

12.7.25 Getting Help

The Database utility provides help in the same ways as all of the IBM Works components previously described, as explained in 12.7.7, "Getting Help" on page 926.

Multiple Field Input

The IBM Works Database allows you to enter multiple fields at one time, saving time and aligning the text for you.

12.7.26 Report Writer

The Report Writer allows you to take data from the IBM Works Database and produce reports from it. It also allows you to design the layout of your reports with your mouse using graphical techniques. When you have created your reports, you can print them or display them on your panel.

12.7.27 Report Writer Modes

As with the IBM Works Database, the Report Writer provides two operating modes:

Edit Mode In this mode you can design your report or change its format.

View Mode This mode allows you to view the report in the document window.

You can switch between these modes by selecting the **Edit Report** or **View Report** options from the File menu, or by clicking on the **Report Edit** and **Report View** icons from the Report Ribbon.

12.7.28 Report View Setup

You can customize the view of your reports by selecting which tool bars you want to use. The Report Writer provides the tool bars shown in Figure 524.

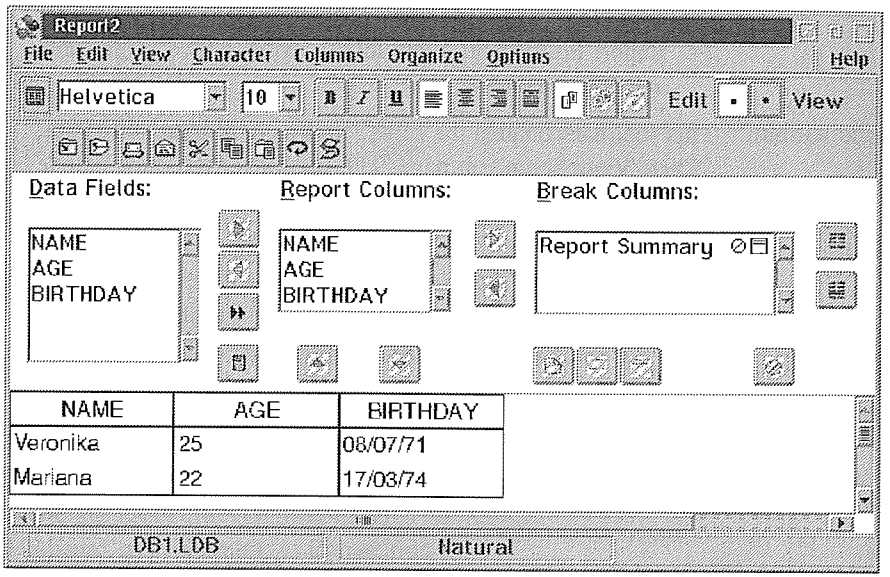

Figure 524. IBM Works - Chart Types

You are allowed to enable or disable the following tool bars from the View menu:

Formatting Ribbon This tool bar, also called the Report Ribbon, contains the following icons:

- Document Tack: allows you to drag the document to the printer
- Font Field: displays the currently selected font and lets you change it
- Point Size Field: displays the point size for the currently selected font and lets you change it
- Attribute Icons: allow you to choose bold, italic and underline options

- Alignment Icons: allow you to choose one of four alignments: left, center, right or justified
- Sort Icon: uses the current sort order to display report records
- Index Icon: uses the current index order to display report records
- Record Select Icon: uses the current selection criteria to determine which records will be included in the report
- Report Edit/Report View Icons: switch between the Edit and View modes

Operations Ribbon This tool bar contains the same icons as described in 12.7.16, "Chart View Setup" on page 939, except for the draw palette which is not available in the Report Writer.

Style Palette This moveable bar makes it easy to define and apply character styles. It contains a Style field that shows the current character style, and also includes Define and Apply buttons that allow you to select a character style selection for your text and apply the style.

Status Bar This bar, at the bottom of the window, provides information about the current activity or mode in which you are working. On the left side, it describes the menu option currently selected or other status information

These last two tool bars provide the same functions as described in 12.7.16, "Chart View Setup" on page 939.

12.7.29 Creating and Formatting Reports

When you create a new report, you are first asked to select the database on which it will be based. Then you are taken into Edit mode, where the Data Fields list is displayed, and you are allowed to select the **Report** and **Break Columns** for your report.

You can also use the items provided by the Commands Menu to specify the format of your report.

From the Columns menu you can:

- Establish the column width and change the display format of the currently selected items.

- Change the text alignment (left, center, right or justify).
- Edit the currently selected column label.
- Change the attributes for displaying duplicate field information.
- Display the attributes for the currently defined groups and for the report summary.

From the Organize menu you can:

- Use the current sort criteria and the currently selected index.
- Select or edit an existing index, or create a new one.
- Use the defined record select criteria, or define a new one.

From the Options menu you can select items to:

- Display the header and footer attributes.
- Change the data display attributes:
  Hide Display: toggles the visibility of the data records.
  Row Height: specifies the number of lines for a row.
- Display a summary of the currently defined report breaks.
- Change the page setup.
- Enable or disable the text wrapping.
- Select all fields to be displayed in the report.

After you have designed your report, you can view it in the document window by switching to Report View mode with any of the procedures explained in 12.7.27, "Report Writer Modes" on page 950. Operations while viewing the report in this mode are limited to scrolling through the records, selecting and copying records to the clipboard, and returning to Report Edit mode.

12.7.30 Exporting Files

The IBM Works Report Writer allows you to export files, in any of the file formats listed in Table 16, by using the **Export** option from the File menu.

Table 16. Report Writer - Supported File Formats

File Extension	Description
.LRP	Report
.CSV	Comma Separated Values
.TSV	Tab Separated Values

12.7.31 Getting Help

The Report Writer provides help in the same ways as all of the other IBM Works components, as explained in 12.7.7, "Getting Help" on page 926.

12.7.32 Simplifying Your Work

12.7.33 Using Templates

IBM Works provides Template icons to take advantage of the drag and drop feature of OS/2 Warp 4 and simplify your work.

You can find the following templates in the IBM Works folder:

- Document
- Sheet
- Chart
- Database
- Report
- Contact List

These templates can be used the same way as any other template icon from the Templates folder, as explained in 3.3.6, "Creating a New Object" on page 177. (identify the area on Templates). This means that simply by dragging one of these icons and dropping it in the desired target folder or on your desktop, you can create new documents, spreadsheets, charts, databases, reports or contact lists.

You can also find in the IBM Works folder the Samples folder, which contains example icons of each of the IBM Works components mentioned above.

12.7.34 Dragging and Dropping

The following are some typical situations in which you can take advantage of the use of the drag and drop facility of OS/2 Warp 4.

12.7.34.1 Drag and Drop between IBM Works Components

You can drag and drop selected text and graphics from the Chart and Spreadsheet utilities to the Word Processor application, another chart or another spreadsheet.

By default, the drag and drop feature copies information, but if you use the Ctrl+Shift keys in conjunction with the drag and drop you can achieve a Paste-Link between the Spreadsheet application and the Word Processor utility. This means that every modification made in any data in one of them will be automatically reflected in the other one.

12.7.34.2 Drag and Drop Integration between PIM and IBM Works

PIM

PIM stands for Personal Information Manager. If you haven't read 12.7.20, "Personal Information Manager" on page 943 yet, we suggest you do so in order to understand this section better.

You can drag and drop one or more contacts from the Phone Book or Contact List onto documents created with any of the IBM Works components. You can also drag and drop a Contact List to a document to attach the contacts in the list to the document.

The documents that have contacts dropped on them will display their icons with cards attached.

You can also use the drag and drop to create a merged word processor document. You just have to drag and drop the desired contacts from your Phone Book or Contact List to the word processor document containing merge fields. The contacts will be merged with the document creating a merged set of documents.

Documents with contacts attached can be dragged and dropped on a printer, or printed from the open document to produce a mail merge batch with one document tailored for each contact. If you drag this merged document to the fax, it will use the fax numbers associated with each contact to produce a fax distribution as part of the mail merge.

You can drag and drop contacts onto a document icon or its open window achieving the same result.

Macros

All IBM Works components provide the possibility of working with macros. Please refer to the online help for more information about how to use them.

12.7.35 Printing Tips

12.7.36 Printing from IBM Works

IBM Works performs all printing in the background, so that you can continue to do other tasks with IBM Works while you are printing. The steps for printing are the same in all IBM Works programs, although the dialog box is a little different between the Database and Spreadsheet applications:

1. Select **Print** from the File menu.
2. In the dialog box, select the appropriate options:

   Printer - Allows any defined printer selected.
   Copies - Shows the number of copies to be printed
   Reverse Order - Prints the document in reverse order from the last page to the first page.
   Draft - Prints in draft quality if this mode is supported by your printer.
3. Select the pages to be printed. The default is all pages, but you may choose to print a range of pages by selecting the **Form** radio button and entering the beginning and ending page numbers.
4. To begin printing, click on **Print**. To end the operation, click on **Cancel**.

You will notice a movable floating print palette, visible while printing is taking place. This shows all IBM Works print jobs in the OS/2 Warp 4 printer queue. If you want to delete a file from the queue, you can do so by highlighting the file you wish to delete and pressing **Cancel**.

While a file is being printed, you are able to switch to a different module or perform limited work within the file being printed, including saving it, but you cannot make changes to the file being printed.

12.7.37 Setting Up Your Printer

If you wish to switch from portrait to landscape orientation in IBM Works, you need to set the page orientation in both the Page Setup menu and the Printer Setup menu. You may find it easier to set up two printer objects: one for landscape and one for portrait orientation.

1. Select **Printer Setup** from the file menu.
2. Select the printer name from the Printer List.
3. Click on **Setup**.
4. A dialog with options for the selected printer opens.
5. Select the options you want and select **OK**.
6. To store the settings, click on **Save**.

If your page setup parameters and your printer setup parameters are different, the page setup parameters will take precedence.

Note

When you change printer setup, the default settings suggested for page setup will change for any new documents that you create.

12.8 AskPSP

Use AskPSP to obtain answers to problems and questions concerning OS/2. AskPSP can be your own personal help desk that can assist you in finding solutions.

AskPSP lets you run a search tool called CasePoint to open a database of common problems and questions relating to OS/2. The technical database is updated monthly and is available by subscription to the OS/2 Technical connection CD-ROM.

12.9 Printer Utilities

12.9.1 HP Jet Admin

HP JetAdmin was produced jointly by the Hewlett-Packard Company and IBM. It delivers an advanced network printing solution that enables you to easily install, configure, query and troubleshoot network-attached printers from your OS/2 Desktop.

HP JetAdmin makes administrators more productive by giving them the tools to remotely manage network-attached printers from their OS/2 Desktop. Users no longer have to go to the printer or print server to determine status or to isolate problems. Users increase their productivity by receiving printer and job status on their OS/2 Desktop.

Some of the highlights of HP JetAdmin include the following:

- Users can see the true status of their jobs. All users receive true end-of-job notification. No more wasted trips to the printer!
- An administrator can centralize setup and control of network printers on the OS/2 Warp print server. This enables an administrator to reduce network traffic and to control access to network printers using OS/2 Warp security services.
- A user can see the status of the printer. For example, if it is out of paper, or if the cover of the printer is open.

12.9.2 HP Jet Admin Port Driver

Use HP JetAdmin Port Driver to manage and print to a Hewlett-Packard network-attached printer directly from an OS/2 Desktop.

HP JetAdmin Port Driver is usually installed by the administrator who controls printing on the LAN. After installing, the administrator must define Printer objects on their OS/2 Desktops. The printer object accesses the network-attached printer through local print queues. The administrator then defines access control profiles for the local print queues, thereby giving users access to the printers.

For more information on JetAdmin:

1. Insert the OS/2 Warp 4 CD-ROM into your CD-ROM drive.
2. Double-click on **OS/2 System.**
3. Double-click on **Drives.**
4. Double-click on your CD-ROM drive object.
5. Click on **OS2IMAGE.**
6. Click on **FI.**
7. Click on **BONUSPAK.**
8. Click on **HPJET.**
9. Double-click on **README.1ST.**

12.9.3 Mark Vision for OS/2

MarkVision for OS/2 was produced jointly by the Lexmark International, Inc. and IBM. It delivers an advanced network printing solution that enables users to easily install, configure, query and troubleshoot network-attached printers from the OS/2 Desktop.

MarkVision for OS/2 makes administrators more productive by giving them the tools to remotely manage network-attached printers from the OS/2 Desktop. They no longer have to go to the printer or print server to determine status or to isolate problems. Users increase their productivity by receiving printer and job status on the OS/2 Desktop.

Some of the highlights of MarkVision for OS/2 include the following:

- User can see the true status of their jobs. All users receive true end-of-job notification. No more wasted trips to the printer!

- An administrator can centralize setup and control of network printers on the OS/2 Warp print server. This enables an administrator to reduce network traffic and to control access to network printers using OS/2 Warp Server security services.
- A user can display the status of the printer. For example, if it is out of paper, or if the cover of the printer is open.
- A user can collect, store, and view a summary of job statistics information including:
  - Number of pages per job
  - Time and date the job completed
  - User and workstation that submitted the job
  - Time-and-date stamped error condition recording
  - Number of duplexed pages as well as simplexed pages

12.9.4 Marknet Port Driver

Use MarkNet Port Driver to manage and print to a Lexmark network-attached printer directly from an OS/2 Desktop.

MarkNet Port Driver is usually installed by the administrator who controls printing on the LAN. After installing, the administrator must define Printer objects on their OS/2 Desktop. The printer object accesses the network-attached printer through local print queues. The administrator then defines access control profiles for the local print queues thereby giving users access to the printers.

For more information on MarkVision:

1. Insert the OS/2 Warp 4 CD-ROM into your CD-ROM drive.
2. Double-click on **OS/2 System.**
3. Double-click on **Drives.**
4. Double-click on your CD-ROM drive object.
5. Click on **OS2IMAGE.**
6. Click on **FI.**
7. Click on **BONUSPAK.**
8. Click on **MARKVIS.**
9. Double-click on **README.1ST.**

12.10 Application Sampler CD

An additional CD that comes with OS/2 Warp 4 contains over 70 different native OS/2 applications. These include word processors, spreadsheets, utilities and games. The applications are mostly beta, lite or timebombed versions of the products but they give you a flavor of what these products can do. Details on how to get the full version or licence keys of the products are contained on the CD-ROM.

The products are as follows:

Application Name	Developer (Company)
Language Companion	Advanced Idea Machines
Tensor	Advanced Idea Machines
IconAuthor	AimTech Corporation
Wipe Out	Boca Soft, Inc.
CPU Monitor Plus	BonAmi Software Corporation
BlueCAD	CadWare
CFS Poker	CFS Nevada, Inc.
ChipChat	ChipChat Technology Group
Disk Jockey	Clear & Simple
Performance Plus	Clear & Simple
NeoN Grafik 3D	TEAM Computer
Back Again/2	Computer Data Strategies
Check +	Computer Interface
Contact Connection	Computer Interface
Smart-Lock File Protect	Corporate Info Management GmbH
Smart-Lock Lite	Corporate Info Management GmbH
Golden Commpass	Creative Systems Programming
DeScribe Voyager	DeScribe, Inc.
Deskman/2	Development Technologies
American Heritage Dictionary	DUX Software Corp.
SimCity Classic	DUX Software Corp.

Image Alchemy	Handmade Software
KopyKat	Hilgraeve
IC Phone	IBM Corporation
TD-Gammon	IBM Corporation
Visual Age for Basic	IBM Corporation
OpenGL Samples	IBM Corporation
Lockaroo	IBM Corporation
Voice Klondike	IBM Corporation
Post Road Mailer Blue	Innoval System Solutions, Inc.
Post Road Mailer Green	Innoval System Solutions, Inc.
Post Road News Reader	Innoval System Solutions, Inc.
WebExtra	Innoval System Solutions, Inc.
Remote Services Management	International Software Solutions
WordPro	Lotus Corporation
Sim City 2000	Maxis, Inc.
Sim Town	Maxis, Inc.
Widget Workshop	Maxis, Inc.
Algebra Quest	Media Quest Corp.
Pmtel/3	MediaSys
PhotoSuite	MGI Software
Opalis	Opalis GmbH
Orange Hill Workplace	Orange Hill Software
Document Conversion Manager	Pembroke International
Ctrl-Alt-Del Commander	Perez Computing Services
IPF Editor	Perez Computing Services
PartitionMagic	PowerQuest Corporation
pcVerse	Profile Solutions
Q-SMS	Quality Systems Development

RhinoComm	Rhintek
Seagate Backup for OS/2	Seagate Software
The Alphabet Zoo	Second Story Productions
N-A-P	Snow Storm Software
Escape	Snow Storm Software
Mirage	Snow Storm Software
FileStar/2	SofTouch Systems, Inc.
GammaTech Internet Relay Chat	SofTouch Systems, Inc.
GammaTech Utilities	SofTouch Systems, Inc.
UniMaint	SofTouch Systems, Inc.
ColorWorks V1+	SPG Inc.
Star Office	Star Division Germany
Galactic Civilizations	Stardock Systems
Object Desktop	Stardock Systems
Clearlook	Sundial Systems Corp.
Relish	Sundial Systems Corp.
Mesa2	Sundial Systems Corp.
Secure Workplace for OS/2	Syntegration
Infovia	Telefonica
CopyShop/2	Trafalgar Business Systems, Inc.
Photo>Graphics	True Spectra Software, Inc.
InfoOnCall	TTC Computer Products
Safe Guard Easy	UtiMaco
PageConnect for OS/2	Workplace Software
Soup Kidchen	Widdow Works
ZipStream	Carbon Based Software

Appendix A. OS/2 Warp 4 Hardware Requirements

This appendix provides details on the hardware requirements to install and run OS/2 Warp 4. It is very important to understand that this information describes the *minimum* requirements. Additional applications will require appropriate extended memory, disk space, and processor power.

In addition to the information provided in this appendix, you may also want to have a look at the following web page:

`http://www.austin.ibm.com/pspinfo/os2hw.html`

Also refer to Appendix C, "OS/2 Device Driver Pak CD" on page 987 for information about:

- Processor requirements
- Base memory requirements
- Disk space requirements

A.1 OS/2 Warp 4 Processor Requirements

To install and run OS/2 Warp 4 requires a 486DX processor. The use of the VoiceType function, requires a Pentium with 90 MHz minimum tact frequency.

A.2 OS/2 Warp 4 Base Memory Requirements

The OS/2 Warp 4 CD-ROM installation process requires at least 4 MB of main memory to install the base OS/2 Warp 4 product. OS/2 Warp 4 will terminate the installation process if a system has less than 4 MB main memory installed.

The OS/2 Warp 4 installation process, done remotely over a LAN, requires at least 6 MB main memory to install the base OS/2 Warp 4 product. The additional memory is required to run the LAN client application, which allows you to access the LAN. OS/2 Warp 4 will terminate the installation process if a system has less than 6 MB main memory installed.

The memory requirement above is the absolute minimum. You will need to increase your base memory requirements if you intend to use other components of OS/2 Warp 4, such as communication or VoiceType. Table 17 shows additional base memory requirements for specific OS/2 Warp 4 components. Please take into account that those memory requirements are in *addition* to the base memory requirements for the base OS/2 Warp 4 product.

Table 17 (Page 1 of 2). Additional Memory Requirements for OS/2 Warp 4 Components

Description	Additional memory
VoiceType	12 MB

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Table 17 (Page 2 of 2). Additional Memory Requirements for OS/2 Warp 4 Components	
Description	**Additional memory**
Network adapter/protocol services	2 MB
File/print client	4 MB
TCP/IP	4 MB
NetWare client for OS/2	2 MB
Remote access client	6 MB
SystemView agent	1 MB

Important: Please remember that the table above shows only the minimum memory requirements. Slow performance and excessive growth of your SWAPPER.DAT file may indicate that adding more memory would increase your system performance considerably.

A.3 OS/2 Warp 4 Disk Space Requirements

OS/2 Warp 4 requires between 60 MB and 256 MB disk space, depending on the hardware configuration and the additional options that you decide to install. Additionally, certain components of OS/2 Warp 4, such as VoiceType, have their own specific disk space requirements. For example, the VoiceType enrollment process will require a temporary disk space of 48 MB to process the enrollment.

Note

If you already have DOS and/or Windows installed on your system, OS/2 Warp 4 will not delete DOS or Windows from your hard disk unless you format your boot drive during the installation process. You may therefore be able to recover some disk space by deleting your DOS and/or Windows directories after installing OS/2 Warp 4.

A.3.1 Disk Space Requirements for Installing Options

The required disk space will very much depend on the options that you decide to install. The following list shows you how much space will be taken up by the operating system and each of these options:

- **Assistance Center**

```
OS/2 Tutorial                    4309 KB
OS/2 Command Reference            825 KB
REXX Information                  768 KB
WarpGuide User Interface Agent   4367 KB

Assistance Center Total         10.03 MB
```

- **Fonts**

Courier	273 KB
Helvetica	629 KB
System Mono-spaced	86 KB
Times Roman	596 KB
Courier (outline)	320 KB
Helvetica (outline)	259 KB
Times New Roman (outline)	307 KB
Fonts Total	**2.42 MB**

- **Optional System Utilities**

Backup Hard Disk	27 KB
Change File Attributes	36 KB
Display Directory Tree	33 KB
Manage Partitions	223 KB
Label Diskettes	33 KB
Link Object Modules	450 KB
Picture Viewer	122 KB
PM REXX	146 KB
Recover Files	45 KB
Restore Backed-up Files	35 KB
Sort Filter	31 KB
Installation Utilities	419 KB
Create Utility Diskettes	192 KB
Serviceability and Diagnostic Aids	542 KB
Optional System Utilities Total	**2.29 MB**

- **Optional System Components**

OpenDoc	5842 KB
VoiceType	23753 KB
VoiceType (enrollment)	48000 KB
Security	496 KB
Dedicated DOS/Windows Session	349 KB
High Performance File System	470 KB
Optional System Components Total	**77.39 MB**

- **BonusPack**

CompuServe	2736 KB
HyperAccess Line	656 KB
IBMWorks	14411 KB
FaxWorks	1266 KB
Video In	467 KB
AskPSP	4008 KB
Remote Support Tool	1441 KB
JetAdmin	560 KB
JetAdmin Port Driver	1645 KB

MarkVision	4879 KB
MarkNet Port Driver	5238 KB
BonusPack Total	**36.42 MB**

- **Java Development**

Toolkit	4888 KB
Samples	1265 KB
Java Development Total	**6.01 MB**

- **Tools and Games**

Enhanced Editor	1933 KB
Search and Scan Tool	68 KB
OpenGL Library	4905 KB
Optional Bit Maps	10073 KB
Solitaire - Klondike	2762 KB
Pulse	43 KB
Chess	2828 KB
Mahjongg Solitaire	2151 KB
Tools and Games Total	**24.19 MB**

- **OS/2 DOS Support**

DOS Protect Mode Interface	29 KB
Virtual Expanded Memory Management	19 KB
Virtual Expanded Memory Support	9 KB
OS/2 DOS Support Total	**1.54 MB**

- **WIN-OS/2 Support**

Readme Files	136 KB
Accessories	1039 KB
Screen Savers	73 KB
Sound	115 KB
WIN-OS/2 Support Total	**6.11 MB**

- **Multimedia Software Support**

Base Multimedia Support	19294 KB
Multimedia OpenDoc Support	2929 KB
Software Motion Video	728 KB
WIN-OS/2 Support Total	**22.41 MB**

A.3.2 Disk Space Requirements for Networking Options

- **Networking Support**

File and Print Client	12.98 MB
TCP/IP Services	29.74 MB
Remote Access Client	4.64 MB
System Management Client	12.08 MB
NetWare Client	5.72 MB
Mobile Office Services	3.73 MB
Networking Support Total	**68.89 MB**

A.4 Additional Hardware Requirements for OS/2 Warp 4

Some of the components available with OS/2 Warp 4 require additional hardware, as follows:

- **Multimedia Software Support**

  Requires an additional sound card.

- **VoiceType**

  Requires an additional sound card and a high-quality microphone. See A.4.1, "VoiceType Microphone" for additional information.

- **Remote Internet and Remote LAN Access**

  Requires an additional remote connection device, for example, modem, ISDN adapter card, etc.

- **Network Internet and LAN Access**

  Requires an additional network interface card, for example, Ethernet, token-ring, etc.

A.4.1 VoiceType Microphone

The use of the VoiceType navigation and dictation requires a high-quality microphone. The following list provides details on the technical specification required to achieve the best recognition rates. You will need a microphone that is designed for close range pickup to reduce background noise. The microphone must have a flat audio frequency response range. Other characteristics must be met, including the following:

- Type: dynamic
- Frequency response: 50 to 15,000 Hz
- Polar pattern: cardioid (unidirectional) response, uniform with frequency, symmetrical about axis
- Impedance: 150 ohms for connection to microphone inputs rated at 19 to 300 ohms
- Output level: 1,000 Hz
  - Open Circuit voltage: -47.0 dB (4.5 MV)
  - Power level: -66 dB
- Sensitivity: (Hum) 38.4 dB equivalent SPL in a 1 millioersted field

Appendix B. OS/2 Warp 4 Directory and File Structure

This appendix provides an overview of the OS/2 Warp 4 file and directory structure. We look at the CD-ROM structure as well as the structure on your hard disk drive after installation.

B.1 CD-ROM Structure

OS/2 Warp 4 is available only on CD.

B.1.1 The ROOT Directory

The root directory of the OS/2 Warp 4 CD-ROM contains the following files and directories

```
Volume in drive E has no label.
The Volume Serial Number is F7CE:25EA.
Directory of E:\

 9-04-96   9:10a     <DIR>           0  .
 9-04-96   9:10a     <DIR>           0  ..
 6-14-96  10:54a      1894           0  CDINST.BAT
 6-14-96  11:03a      1894           0  CDINST.CMD
 9-04-96   9:10a     <DIR>           0  CID
 9-04-96   9:10a     <DIR>           0  DISKIMGS
 6-14-96  10:48a      9459           0  DMF_PS2.CMD
 9-04-96   9:10a     <DIR>           0  IBMINST
 9-04-96   9:10a     <DIR>           0  IMAGES
 9-04-96   9:10a     <DIR>           0  INFO
 8-21-96   3:28p       956           0  INSTALL.CMD
 8-24-96  11:12a     29844           0  MAKEDSKS.BAT
 8-24-96  11:12a     29839           0  MAKEDSKS.CMD
 9-04-96   9:10a     <DIR>           0  OS2IMAGE
 8-30-96   7:39p        11           0  OS2SE20.SRC
 8-21-96   3:30p       838           0  PRODDSKS.CMD
 8-30-96   5:58p     47168           0  README
 8-30-96   5:58p     33470           0  README.INS
 8-29-96  10:06p    418176           0  RSPINST.EXE
 8-14-96   2:57a     89066           0  SAMPLE.RSP
       20 file(s)     662615 bytes used
                         0 bytes free
```

As you can see, there are a number of subdirectories and some match and command files. The command and batch files allow you to initiate the OS/2 Warp 4 installation process. There are also a couple of Readme files. The subdirectories contains the OS/2 Warp 4 program code. This code is stored in different images formats. The subdirectories are:

```
Volume in drive E has no label.
The Volume Serial Number is F7CE:25EA.

Directory of E:\

 9-04-96   9:10a     <DIR>           0  .
 9-04-96   9:10a     <DIR>           0  ..
 9-04-96   9:10a     <DIR>           0  CID
 9-04-96   9:10a     <DIR>           0  DISKIMGS
```

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```
9-04-96   9:10a     <DIR>           0  IBMINST
9-04-96   9:10a     <DIR>           0  IMAGES
9-04-96   9:10a     <DIR>           0  INFO
9-04-96   9:10a     <DIR>           0  OS2IMAGE
       8 file(s)          0 bytes used
```

B.1.2 The CID Directory

The CID directory contains the following subdirectories:

```
Directory of E:\CID

9-04-96   9:10a     <DIR>           0  .
9-04-96   9:10a     <DIR>           0  ..
9-04-96   9:10a     <DIR>           0  DLL
9-04-96   9:10a     <DIR>           0  EXE
9-04-96   9:10a     <DIR>           0  IMG
9-04-96   9:10a     <DIR>           0  LOCINSTU
9-04-96   9:10a     <DIR>           0  NIFS
9-04-96   9:10a     <DIR>           0  SRVIFS
       8 file(s)          0 bytes used
```

The IMG subdirectory contains the installation code for all the OS/2 Warp 4 connectivity features. During the installation process the files are copied from these directories onto your hard disk drive.

```
Directory of E:\CID\IMG

9-04-96   9:10a     <DIR>           0  .
9-04-96   9:10a     <DIR>           0  ..
9-04-96   9:1Da     <DIR>           0  ADFRSP
9-04-96   9:1Da     <DIR>           0  BOOKS
9-04-96   9:10a     <DIR>           0  IBMPEER
9-04-96   9:1Da     <DIR>           0  LDREM
9-04-96   9:10a     <DIR>           0  MFS
9-04-96   9:10a     <DIR>           0  MPTS
9-04-96   9:10a     <DIR>           0  NETFIN
9-04-96   9:10a     <DIR>           0  NSC
9-04-96   9:10a     <DIR>           0  NWREQ
9-04-96   9:10a     <DIR>           0  SVAGENT
9-04-96   9:10a     <DIR>           0  TCPAPPS
      13 file(s)          0 bytes used
```

B.1.3 The DISKIMGS Directory

The OS/2 Warp 4 diskette images are stored in the DISKIMGS directory. In the directory there are a couple of disk utilities that you can use to extract these images or to create your own. The subdirectories under DISKIMGS are as follows:

```
Directory of E:\DISKIMGS

9-04-96   9:10a     <DIR>           0  .
9-04-96   9:10a     <DIR>           0  ..
9-04-96   9:10a     <DIR>           0  OS2
       3 file(s)          0 bytes used

Directory of E:\DISKIMGS\OS2

9-04-96   9:10a     <DIR>           0  .
9-04-96   9:10a     <DIR>           0  ..
9-04-96   9:10a     <DIR>           0  35
       3 file(s)          0 bytes used
```

```
Directory of E:\DISKIMGS\OS2\35

 9-04-96   9:10a     <DIR>           0  .
 9-04-96   9:10a     <DIR>           0  ..
       2 file(s)          0 bytes used
```

All the base OS/2 Warp 4 diskette images are stored in the above directory. If you need to create a diskette or diskettes for whatever reason, you can find the diskette images here.

B.1.4 The IBMINST Directory

This directory contains a number of OS/2 Warp 4 installation aids, sample response files, etc. The directory tree looks like the following:

```
Directory of E:\IBMINST

 9-04-96   9:10a     <DIR>           0  .
 9-04-96   9:10a     <DIR>           0  ..
 9-04-96   9:10a     <DIR>           0  ICONS
 9-04-96   9:10a     <DIR>           0  TABLES
       4 file(s)          0 bytes used

Directory of E:\IBMINST\ICONS

 9-04-96   9:10a     <DIR>           0  .
 9-04-96   9:10a     <DIR>           0  ..
       2 file(s)          0 bytes used

Directory of E:\IBMINST\TABLES

 9-04-96   9:10a     <DIR>           0  .
 9-04-96   9:10a     <DIR>           0  ..
       2 file(s)          0 bytes use
```

B.1.5 The IMAGES Directory

The images directory contains the diskette images of the OS/2 Warp 4 connectivity. You can use these images to create a set of installation diskettes for the NetWare requester, LAN distance, TCPIP, etc. The directory looks like the following:

```
Directory of E:\IMAGES

 9-04-96   9:10a     <DIR>           0  .
 9-04-96   9:10a     <DIR>           0  ..
 9-04-96   9:10a     <DIR>           0  LANDIST
 9-04-96   9:10a     <DIR>           0  MFS
 9-04-96   9:10a     <DIR>           0  MPTS
 9-04-96   9:10a     <DIR>           0  NETWARE
 9-04-96   9:10a     <DIR>           0  NSC
 9-04-96   9:10a     <DIR>           0  PEER
 9-04-96   9:10a     <DIR>           0  SVCA
 9-04-96   9:10a     <DIR>           0  TCPIP
 9-04-96   9:10a     <DIR>           0  TMEI0
      11 file(s)          0 bytes used
```

B.1.6 The INFO Directory

The INFO directory contains a utility called NPINST.EXE that allows you to install the OS/2 Warp 4 network installation utility onto a specific drive. The installation process uses NPINST.EXE to install the connectivity components of OS/2 Warp 4 during the installation process.

B.1.7 The OS2IMAGE Directory

The OS2IMAGE directory contains the OS/2 Warp 4 base code. During the installation process the code is copied from this directory onto your hard disk drive. The OS2IMAGE directory has the following subdirectories:

```
Directory of E:\OS2IMAGE

9-04-96   9:10a     <DIR>          0  .
9-04-96   9:10a     <DIR>          0  ..
9-04-96   9:10a     <DIR>          0  DEBUG
9-04-96   9:10a     <DIR>          0  DISK_0
9-04-96   9:10a     <DIR>          0  DISK_1
9-04-96   9:10a     <DIR>          0  DISK_10
9-04-96   9:10a     <DIR>          0  DISK_11
9-04-96   9:10a     <DIR>          0  DISK_12
9-04-96   9:10a     <DIR>          0  DISK_13
9-04-96   9:10a     <DIR>          0  DISK_14
9-04-96   9:10a     <DIR>          0  DISK_15
9-04-96   9:10a     <DIR>          0  DISK_16
9-04-96   9:10a     <DIR>          0  DISK_17
9-04-96   9:10a     <DIR>          0  DISK_18
9-04-96   9:10a     <DIR>          0  DISK_19
9-04-96   9:10a     <DIR>          0  DISK_2
9-04-96   9:10a     <DIR>          0  DISK_20
9-04-96   9:10a     <DIR>          0  DISK_21
9-04-96   9:10a     <DIR>          0  DISK_22
9-04-96   9:10a     <DIR>          0  DISK_23
9-04-96   9:10a     <DIR>          0  DISK_24
9-04-96   9:10a     <DIR>          0  DISK_25
9-04-96   9:10a     <DIR>          0  DISK_26
9-04-96   9:10a     <DIR>          0  DISK_27
9-04-96   9:10a     <DIR>          0  DISK_28
9-04-96   9:10a     <DIR>          0  DISK_29
9-04-96   9:10a     <DIR>          0  DISK_3
9-04-96   9:10a     <DIR>          0  DISK_30
9-04-96   9:10a     <DIR>          0  DISK_31
9-04-96   9:10a     <DIR>          0  DISK_32
9-04-96   9:10a     <DIR>          0  DISK_33
9-04-96   9:10a     <DIR>          0  DISK_34
9-04-96   9:10a     <DIR>          0  DISK_35
9-04-96   9:10a     <DIR>          0  DISK_36
9-04-96   9:10a     <DIR>          0  DISK_37
9-04-96   9:10a     <DIR>          0  DISK_38
9-04-96   9:10a     <DIR>          0  DISK_39
9-04-96   9:10a     <DIR>          0  DISK_4
9-04-96   9:10a     <DIR>          0  DISK_5
9-04-96   9:10a     <DIR>          0  DISK_6
9-04-96   9:10a     <DIR>          0  DISK_7
9-04-96   9:10a     <DIR>          0  DISK_8
9-04-96   9:10a     <DIR>          0  DISK_9
9-04-96   9:10a     <DIR>          0  DISK_W1
9-04-96   9:10a     <DIR>          0  DISK_W2
9-04-96   9:10a     <DIR>          0  DISK_W3
9-04-96   9:10a     <DIR>          0  OISK_W4
```

```
 9-04-96   9:10a     <DIR>           0  DISK_W5
 9-04-96   9:10a     <DIR>           0  DISP_1
 9-04-96   9:10a     <DIR>           0  DISP_2
 9-04-96   9:10a     <DIR>           0  DISP_3
 9-04-96   9:10a     <DIR>           0  DISP_4
 9-04-96   9:10a     <DIR>           0  DISP_5
 9-04-96   9:10a     <DIR>           0  FI
 9-04-96   9:10a     <DIR>           0  NOTES
 9-04-96   9:10a     <DIR>           0  PMDD_1
 9-04-96   9:10a     <DIR>           0  PMDD_2
 9-04-96   9:10a     <DIR>           0  PMDD_3
 9-04-96   9:10a     <DIR>           0  PMDD_4
 9-04-96   9:10a     <DIR>           0  PMDD_5
 9-04-96   9:10a     <DIR>           0  PMDD_6
 9-04-96   9:10a     <DIR>           0  SYM_1
 9-04-96   9:10a     <DIR>           0  SYM_2
 9-04-96   9:10a     <DIR>           0  SYM_3
 9-04-96   9:10a     <DIR>           0  SYM_4
 9-04-96   9:10a     <DIR>           0  SYM_5
      66 file(s)          0 bytes used
```

The above directories contain all the OS/2 Warp 4 base code including VoiceType and the BonusPak.

Note

The above directories are only a subset of the directories in the OS/2 Warp 4 CD-ROM. Due to space considerations, we are unable to list the entire directory structure. To look at it, execute the following command on your CD drive:

```
DIR /S
```

or

```
DIR /S > output.file
```

This will give you a complete directory and file listing of the OS/2 Warp 4 CD-ROM.

B.2 Hard Disk Drive Structure

After OS/2 Warp 4 has been installed on your disk you will have the following directory structure.

B.2.1 The ROOT Directory

```
The volume label in drive D is OS2.
The Volume Serial Number is E70A:5814.
Directory of D:\

 9-04-96  11:13a       437           0  AUTOEXEC.BAT
 9-04-96  10:38a     <DIR>           0  BonusPak
 9-04-96  10:44a     16896           0  boot.dat
 8-12-96   2:43a     43369           0  CDFS.IFS
 9-04-96  10:50a     <DIR>           0  CID
 9-04-96  11:16a      4447           0  CONFIG.SYS
 9-04-96  11:07a       134           0  D
 9-04-96  11:05a     <DIR>         548  Desktop
 9-04-96  10:37a     <DIR>           0  DMISL
 9-04-96  10:44a     33280           0  DOS.DAT
```

```
 9-10-96   2:42p       696           0  dump.out
 9-04-96  10:50a     <DIR>           0  IBMCOM
 9-04-96  10:52a     <DIR>           0  IBMI18N
 9-04-96  10:16a     <DIR>           0  IBMINST
 9-04-96  11:08a     <DIR>           0  IBMLAN
 9-04-96  11:10a       855           0  IBMLVL.INI
 9-04-96  10:09a     <DIR>           0  IBMVESA
 9-04-96  10:40a     <DIR>           0  javaos2
 9-04-96  10:07a     <DIR>           0  LANGUAGE
 9-04-96  10:19a     <DIR>         372  Maintenance Desktop
 9-04-96  10:30a     <DIR>           0  MMOS2
 9-04-96  10:50a     <DIR>           0  MPTN
 9-04-96  11:09a     <DIR>           0  MUGLIB
 9-04-96  11:11a     <DIR>           0  NSC
 9-04-96  10:07a     <DIR>         300  OS2
 9-04-96  10:07a     <DIR>           0  PSFONTS
 8-30-96   5:58p     47168           0  README
 9-04-96  10:36a      8704           0  registry.dat
 9-04-96  10:20a     <DIR>           0  SPOOL
 9-04-96  11:11a     <DIR>           0  tcpip
 9-04-96  10:09a     <DIR>           0  XVA$DMQS
       31 file(s)     155986 bytes used
                    97645056 bytes free
```

As you can see, the above directory is the OS/2 Warp 4 root directory. It contains all the subdirectories as well as a number of additional files, such as the CONFIG.SYS. The subdirectories are:

```
The volume label in drive D is OS2.
The Volume Serial Number is E70A:5814.

Directory of D:\

 9-04-96  10:07a     <DIR>           0  .
 9-04-96  10:07a     <DIR>           0  ..
 9-04-96  10:38a     <DIR>           0  BonusPak
 9-04-96  10:50a     <DIR>           0  CID
 9-04-96  11:05a     <DIR>         548  Desktop
 9-04-96  10:37a     <DIR>           0  DMISL
 9-04-96  10:50a     <DIR>           0  IBMCOM
 9-04-96  10:52a     <DIR>           0  IBMI18N
 9-04-96  10:16a     <DIR>           0  IBMINST
 9-04-96  11:08a     <DIR>           0  IBMLAN
 9-04-96  10:09a     <DIR>           0  IBMVESA
 9-04-96  10:40a     <DIR>           0  javaos2
 9-04-96  10:07a     <DIR>           0  LANGUAGE
 9-04-96  10:19a     <DIR>         372  Maintenance Desktop
 9-04-96  10:30a     <DIR>           0  MMOS2
 9-04-96  10:50a     <DIR>           0  MPTN
 9-04-96  11:09a     <DIR>           0  MUGLIB
 9-04-96  10:19a     <DIR>         339  Nowhere
 9-04-96  11:11a     <DIR>           0  NSC
 9-04-96  10:07a     <DIR>         300  OS2
 9-04-96  10:07a     <DIR>           0  PSFONTS
 9-04-96  10:20a     <DIR>           0  SPOOL
 9-04-96  11:11a     <DIR>           0  tcpip
 9-04-96  10:09a     <DIR>           0  XVA$DMQS
       24 file(s)         10 bytes used
```

Depending on the options you installed during the installation process, your specific directory structure will vary slightly from the one above. We will now have a brief look at the structures of some of the more important directories.

B.2.2 The BonusPak Directory

Depending on which BonusPak application you installed, this structure will vary, or may not be present at all. For example:

```
Directory of D:\BonusPak

 9-04-96  10:38a     <DIR>           0  .
 9-04-96  10:38a     <DIR>           0  ..
 9-04-96  10:38a     <DIR>           0  askpsp
 9-04-96  10:39a     <DIR>           0  markvis
       4 file(s)          0 bytes used

Directory of D:\BonusPak\askpsp

 9-04-96  10:38a     <DIR>           0  .
 9-04-96  10:38a     <DIR>           0  ..
 9-04-96  10:39a     <DIR>           0  books
       3 file(s)          0 bytes used

Directory of D:\BonusPak\askpsp\books

 9-04-96  10:39a     <DIR>           0  .
 9-04-96  10:39a     <DIR>           0  ..
       2 file(s)          0 bytes used

Directory of D:\BonusPak\markvis

 9-04-96  10:39a     <DIR>           0  .
 9-04-96  10:39a     <DIR>           0  ..
 9-04-96  10:40a     <DIR>           0  sounds
       3 file(s)          0 bytes used

Directory of D:\BonusPak\markvis\sounds

 9-04-96  10:40a     <DIR>           0  .
 9-04-96  10:40a     <DIR>           0  ..
       2 file(s)          0 bytes used
```

B.2.3 The Desktop Directory

The desktop directory contains a subdirectory for every object on your OS/2 Warp 4 desktop. This could, of course, also be different for each individual OS/2 Warp 4 workstation. For example:

```
Directory of D:\Desktop

 9-04-96  11:05a     <DIR>           0  .
 9-04-96  11:05a     <DIR>           0  ..
 9-04-96  11:05a     <DIR>        8703  Assistance Center
 9-04-96  11:05a     <DIR>        4575  Connections
 9-04-96  11:05a     <DIR>        8775  OS!2 System
 9-04-96  11:05a     <DIR>        4781  Programs
 9-04-96  11:13a     <DIR>        8533  WebExplorer
       8 file(s)          0 bytes used

Directory of D:\Desktop\Assistance Center

 9-04-96  11:05a     <DIR>           0  .
 9-04-96  11:05a     <DIR>           0  ..
 9-04-96  11:06a     <DIR>        4381  Information
 9-04-96  11:07a     <DIR>         540  Troubleshooting
 9-04-96  11:07a     <DIR>        4722  WarpGuide
```

```
       5 file(s)          0 bytes used

Directory of D:\Desktop\Assistance Center\Information

 9-04-96  11:06a     <DIR>           0  .
 9-04-96  11:06a     <DIR>           0  ..
 9-04-96  11:06a     <DIR>         367  Online Information Overview
 9-04-96  11:06a     <DIR>         345  Read Me
 9-04-96  11:07a     <DIR>         360  Reference and Commands
 9-04-96  11:07a     <DIR>         340  Tasks
       6 file(s)          0 bytes used

Directory of D:\Desktop\Connections

 9-04-96  11:05a     <DIR>           0  .
 9-04-96  11:05a     <DIR>           0  ..
 9-04-96  11:05a     <DIR>         350  Drives
 9-04-96  11:05a     <DIR>         538  Network
 9-04-96  11:05a     <DIR>        8695  Printers
 9-04-96  11:06a     <DIR>         425  Web Sites
       6 file(s)          0 bytes used


Directory of D:\Desktop\Connections\Network

 9-04-96  11:05a     <DIR>           0  .
 9-04-96  11:05a     <DIR>           0  ..
 9-04-96  11:37a     <DIR>         568  File and Print Client¬Resource Browser
 9-04-96  11:14a     <DIR>         489  Network Services
       4 file(s)          0 bytes used


Directory of D:\Desktop\Connections\Network\Network Services\Logons

 9-04-96  11:10a     <DIR>           0  .
 9-04-96  11:10a     <DIR>           0  ..
       2 file(s)          0 bytes used

Directory of D:\Desktop\Connections\Printers

 9-04-96  11:05a     <DIR>           0  .
 9-04-96  11:05a     <DIR>           0  ..
       2 file(s)          0 bytes used

Directory of D:\Desktop\Connections\Web Sites

 9-04-96  11:06a     <DIR>           0  .
 9-04-96  11:06a     <DIR>           0  ..
 9-04-96  11:06a     <DIR>         426  Business & Shopping
 9-04-96  11:06a     <DIR>         403  Computing
 9-04-96  11:06a     <DIR>         402  Education
 9-04-96  11:06a     <DIR>         420  Entertainment
 9-04-96  11:06a     <DIR>         406  IBM Web Pages
 9-04-96  11:06a     <DIR>         409  News and Sports
 9-04-96  11:06a     <DIR>         429  OS!2 Related Web Pages
 9-04-96  11:06a     <DIR>         402  Reference
 9-04-96  11:06a     <DIR>         412  Web Search Sites
      11 file(s)          0 bytes used

Directory of D:\Desktop\OS!2 System

 9-04-96  11:05a     <DIR>           0  .
 9-04-96  11:05a     <DIR>           0  ..
 9-04-96  11:05a     <DIR>        8655  Command Prompts
```

```
 9-04-96  11:05a     <DIR>          361  Minimized¬Window Viewer
 9-04-96  11:07a     <DIR>          665  Problem Determination Tools
 9-04-96  11:05a     <DIR>          339  Startup
 9-04-96  11:05a     <DIR>         9052  System Setup
 9-04-96  11:05a     <DIR>         1346  Templates
        8 file(s)          0 bytes used


Directory of D:\Desktop\OS!2 System\Templates

 9-04-96  11:05a     <DIR>            0  .
 9-04-96  11:05a     <DIR>            0  ..
 9-04-96  11:05a     <DIR>          324  Folder
 9-04-96  11:05a     <DIR>          325  Folder!1
 9-04-96  11:07a     <DIR>         8446  Multimedia Templates
 9-04-96  11:05a     <DIR>         8734  Templates for¬Internet
        6 file(s)          0 bytes used

Directory of D:\Desktop\Programs

 9-04-96  11:05a     <DIR>            0  .
 9-04-96  11:05a     <DIR>            0  ..
 9-04-96  11:07a     <DIR>          407  Applications
 9-04-96  11:07a     <DIR>         8561  Games
 9-04-96  11:13a     <DIR>         9159  Internet¬(Modem)
 9-04-96  11:07a     <DIR>         9679  Java for OS!2
 9-04-96  11:07a     <DIR>         8740  Multimedia
 9-04-96  11:07a     <DIR>          345  New Folder
 9-04-96  11:13a     <DIR>         2150  Personal Communications¬3270!5250 Emulation
 9-04-96  11:13a     <DIR>         8626  TCP!IP¬Internet¬(LAN)
 9-04-96  11:06a     <DIR>          796  Utilities
       11 file(s)          0 bytes used
```

Note

The above structure has been edited and serves only as an example. Your desktop directory will typically be much larger than the above example.

B.2.4 The IBMCOM Directory

This directory is used to store information regarding your networking components such as the PROTOCOL.INI file, etc.

```
Directory of D:\IBMCOM

 9-04-96  10:50a     <DIR>            0  .
 9-04-96  10:50a     <DIR>            0  ..
 9-04-96  10:50a     <DIR>            0  DLL
 9-04-96  10:50a     <DIR>            0  MACS
 9-04-96  10:50a     <DIR>            0  PROTOCOL
        5 file(s)          0 bytes used

Directory of D:\IBMCOM\DLL

 9-04-96  10:50a     <DIR>            0  .
 9-04-96  10:50a     <DIR>            0  ..
        2 file(s)          0 bytes used

Directory of D:\IBMCOM\MACS

 9-04-96  10:50a     <DIR>            0  .
```

```
 9-04-96  10:50a     <OIR>           0  ..
       2 file(s)          0 bytes used

Directory of D:\IBMCOM\PROTOCOL

 9-04-96  10:50a     <DIR>           0  .
 9-04-96  10:50a     <DIR>           0  ..
       2 file(s)          0 bytes used
```

B.2.5 The IBMLAN Directory

The IBMLAN directory stores information about your network file and print component.

```
Directory of D:\IBMLAN

 9-04-96  11:08a     <DIR>           0  .
 9-04-96  11:08a     <DIR>           0  ..
 9-04-96  11:09a     <DIR>           0  ACCOUNTS
 9-04-96  11:08a     <DIR>           0  BACKUP
 9-04-96  11:09a     <DIR>           0  BOOK
 9-04-96  11:09a     <DIR>           0  DCDB
 9-04-96  11:09a     <DIR>           0  DOSLAN
 9-04-96  11:08a     <DIR>           0  INSTALL
 9-04-96  11:09a     <DIR>           0  LOGS
 9-04-96  11:08a     <DIR>           0  NETLIB
 9-04-96  11:08a     <DIR>           0  NETPROG
 9-04-96  11:09a     <DIR>           0  NETSRC
 9-04-96  11:09a     <DIR>           0  REPL
 9-04-96  11:08a     <DIR>           0  SERVICES
 9-04-96  11:09a     <DIR>           0  USERS
      15 file(s)          0 bytes used

Directory of D:\IBMLAN\ACCOUNTS

 9-04-96  11:09a     <DIR>           0  .
 9-04-96  11:09a     <DIR>           0  ..
 9-04-96  11:09a     <DIR>           0  USERDIRS
       3 file(s)          0 bytes used

Directory of D:\IBMLAN\ACCOUNTS\USERDIRS

 9-04-96  11:09a     <DIR>           0  .
 9-04-96  11:09a     <DIR>           0  ..
 9-04-96  11:09a     <DIR>           0  SCRIPTS
       3 file(s)          0 bytes used

Directory of D:\IBMLAN\ACCOUNTS\USERDIRS\SCRIPTS

 9-04-96  11:09a     <DIR>           0  .
 9-04-96  11:09a     <DIR>           0  ..
       2 file(s)          0 bytes used

Directory of D:\IBMLAN\DCDB

 9-04-96  11:09a     <DIR>           0  .
 9-04-96  11:09a     <DIR>           0  ..
 9-04-96  11:09a     <DIR>           0  APPS
 9-04-96  11:09a     <DIR>           0  DEVICES
 9-04-96  11:09a     <DIR>           0  FILES
 9-04-96  11:09a     <DIR>           0  LISTS
 9-04-96  11:09a     <DIR>           0  PRINTERS
       7 file(s)          0 bytes used
```

```
Directory of D:\IBMLAN\DOSLAN

 9-04-96  11:09a     <DIR>           0  .
 9-04-96  11:09a     <DIR>           0  ..
 9-04-96  11:09a     <DIR>           0  DOS
 9-04-96  11:09a     <DIR>           0  NET
       4 file(s)          0 bytes used

Directory of D:\IBMLAN\DOSLAN\DOS

 9-04-96  11:09a     <DIR>           0  .
 9-04-96  11:09a     <DIR>           0  ..
       2 file(s)          0 bytes used

Directory of D:\IBMLAN\DOSLAN\NET

 9-04-96  11:09a     <DIR>           0  .
 9-04-96  11:09a     <DIR>           0  ..
       2 file(s)          0 bytes used
```

Note

The above structure has been edited and serves only as an example. Your IBMLAN directory will typically be much larger than the above example.

B.2.6 The Javaos2 Directory

The Javaos2 directory will only be used if you installed Java support in OS/2 Warp 4. Java support requires an HPFS volume.

```
Directory of D:\javaos2

 9-04-96  10:40a     <DIR>           0  .
 9-04-96  10:40a     <DIR>           0  ..
 9-04-96  10:40a     <DIR>           0  bin
 9-04-96  10:40a     <DIR>           0  demo
 9-04-96  10:40a     <DIR>           0  dll
 9-04-96  10:42a     <DIR>           0  docs
 9-04-96  10:43a     <DIR>           0  include
 9-04-96  10:40a     <DIR>           0  lib
 9-04-96  11:07a     <DIR>         325  weblogs
       9 file(s)          0 bytes used

Directory of D:\javaos2\demo

 9-04-96  10:40a     <DIR>           0  .
 9-04-96  10:40a     <DIR>           0  ..
 9-04-96  10:40a     <DIR>           0  Animator
 9-04-96  10:40a     <DIR>           0  ArcTest
 9-04-96  10:40a     <DIR>           0  BarChart
 9-04-96  10:40a     <DIR>           0  Blink
 9-04-96  10:40a     <DIR>           0  BouncingHeads
 9-04-96  10:41a     <DIR>           0  CardTest
 9-04-96  10:41a     <DIR>           0  DitherTest
 9-04-96  10:41a     <DIR>           0  DrawTest
 9-04-96  10:41a     <DIR>           0  Fractal
 9-04-96  10:41a     <DIR>           0  GraphicsTest
 9-04-96  10:41a     <DIR>           0  GraphLayout
 9-04-96  10:42a     <DIR>           0  hello
 9-04-96  10:41a     <DIR>           0  ImageMap
 9-04-96  10:41a     <DIR>           0  ImageTest
```

```
9-04-96  10:41a     <DIR>           0  JumpingBox
9-04-96  10:41a     <DIR>           0  MoleculeViewer
9-04-96  10:41a     <DIR>           0  NervousText
9-04-96  10:41a     <DIR>           0  ScrollingImages
9-04-96  10:41a     <DIR>           0  SimpleGraph
9-04-96  10:41a     <DIR>           0  SpreadSheet
9-04-96  10:41a     <DIR>           0  TicTacToe
9-04-96  10:41a     <DIR>           0  TumblingDuke
9-04-96  10:41a     <DIR>           0  UnderConstruction
9-04-96  10:41a     <DIR>           0  WireFrame
      26 file(s)          0 bytes used
```

B.2.7 The MMOS2 Directory

The multimedia utilities and applications are stored in the following directory:

```
Directory of D:\MMOS2

 9-04-96  10:30a     <DIR>           0  .
 9-04-96  10:30a     <DIR>           0  ..
 9-04-96  10:30a     <DIR>           0  DLL
 9-04-96  10:32a     <DIR>           0  HELP
 9-04-96  10:35a     <DIR>         314  IMAGES
 9-04-96  10:33a     <DIR>           0  INSTALL
 9-04-96  10:35a     <DIR>           0  MACROS
 9-04-96  10:35a     <DIR>        8395  MOVIES
 9-04-96  10:35a     <DIR>        8114  SOUNDS
       9 file(s)          0 bytes used

Directory of D:\MMOS2\SOUNDS

 9-04-96  10:35a     <DIR>           0  .
 9-04-96  10:35a     <DIR>           0  ..
 9-04-96  10:35a     <DIR>        8117  DESKTOP
 9-04-96  10:35a     <DIR>        8116  GARDEN
 9-04-96  10:35a     <DIR>        8115  OCEAN
 9-04-96  10:35a     <DIR>        8115  SPACE
       6 file(s)          0 bytes used
```

B.2.8 The MPTN Directory

The MPTN directory stores information regarding your connectivity components. For example, the default ETC directory in OS/2 Warp 4 is \MPTN\ETC. An example follows below:

```
Directory of D:\MPTN

 9-04-96  10:50a     <DIR>           0  .
 9-04-96  10:50a     <DIR>           0  ..
 9-04-96  10:50a     <DIR>           0  BIN
 9-04-96  10:50a     <DIR>           0  DLL
 9-04-96  10:50a     <DIR>           0  ETC
 9-04-96  10:50a     <DIR>           0  MSG
 9-04-96  10:50a     <DIR>           0  PROTOCOL
       7 file(s)          0 bytes used

Directory of D:\MPTN\ETC

 9-04-96  10:50a     <DIR>           0  .
 9-04-96  10:50a     <DIR>           0  ..
 9-04-96  11:13a     <DIR>           0  dbcsconv
 9-04-96  11:13a     <DIR>           0  mail
 9-04-96  11:13a     <DIR>           0  mqueue
```

```
       5 file(s)          0 bytes used

Directory of D:\MPTN\MSG

 9-04-96  10:50a     <DIR>           0  .
 9-04-96  10:50a     <DIR>           0  ..
 9-04-96  10:50a     <DIR>           0  NLS
       3 file(s)          0 bytes used
```

B.2.9 The OS2 Directory

This is the directory that contains most of the OS/2 Warp 4 base files, executable, dynamic link libraries, etc. An example follows:

```
Directory of D:\OS2

 9-04-96  10:07a     <DIR>           0  .
 9-04-96  10:07a     <DIR>           0  ..
 9-04-96  10:07a     <DIR>           0  APPS
 9-04-96  11:17a     <DIR>           0  ARCHIVES
 9-04-96  10:36a     <DIR>         766  art
 9-04-96  10:07a     <DIR>         315  BITMAP
 9-04-96  10:07a     <DIR>           0  BOOK
 9-04-96  10:07a     <DIR>           0  BOOT
 9-04-96  10:07a     <DIR>           0  DLL
 9-04-96  10:07a     <DIR>           0  DRIVERS
 9-04-96  10:08a     <DIR>           0  ETC
 9-04-96  10:07a     <DIR>           0  HELP
 9-04-96  10:07a     <DIR>         300  INSTALL
 9-04-96  10:07a     <DIR>           0  MDOS
 9-04-96  10:38a     <DIR>           0  PDPSI
 9-04-96  10:09a     <DIR>           0  POINTERS
 9-04-96  10:07a     <DIR>           0  SYSTEM
      17 file(s)          0 bytes used

Directory of D:\OS2\APPS

 9-04-96  10:07a     <DIR>           0  .
 9-04-96  10:07a     <DIR>           0  ..
 9-04-96  10:07a     <DIR>           0  DLL
       3 file(s)          0 bytes used

Directory of D:\OS2\ARCHIVES

 9-04-96  11:17a     <DIR>           0  .
 9-04-96  11:17a     <DIR>           0  ..
 9-04-96  11:17a     <DIR>           0  0X
 9-04-96  11:17a     <DIR>           0  CURRENT
       4 file(s)          0 bytes used

Directory of D:\OS2\ARCHIVES\0X

 9-04-96  11:17a     <DIR>           0  .
 9-04-96  11:17a     <DIR>           0  ..
 9-04-96  11:05a     <DIR>         375  DESKTOP
       3 file(s)          0 bytes used

Directory of D:\OS2\ARCHIVES\0X\DESKTOP

 9-04-96  11:17a     <DIR>           0  .
 9-04-96  11:17a     <DIR>           0  ..
 9-04-96  11:05a     <DIR>        8434  Assistance Center
 9-04-96  11:05a     <DIR>        4394  Connections
```

```
 9-04-96  11:05a      <DIR>        8424  OS!2 System
 9-04-96  11:05a      <DIR>        4388  Programs
 9-04-96  11:13a      <DIR>        8428  WebExplorer
        7 file(s)          0 bytes used

Directory of D:\OS2\DLL

 9-04-96  10:07a      <DIR>           0  .
 9-04-96  10:07a      <DIR>           0  ..
 9-04-96  10:10a      <DIR>           0  IBMNULL
 9-04-96  10:34a      <DIR>           0  PSCRIPT
        4 file(s)          0 bytes used

Directory of D:\OS2\ETC

 9-04-96  10:08a      <DIR>           0  .
 9-04-96  10:08a      <DIR>           0  ..
 9-04-96  10:15a      <DIR>           0  DSOM
        3 file(s)          0 bytes used

Directory of D:\OS2\HELP

 9-04-96  10:07a      <DIR>           0  .
 9-04-96  10:07a      <DIR>           0  ..
 9-04-96  10:07a      <DIR>           0  GLOSS
        3 file(s)          0 bytes used

Directory of D:\OS2\INSTALL

 9-04-96  10:07a      <DIR>           0  .
 9-04-96  10:07a      <DIR>           0  ..
 9-04-96  10:20a      <DIR>           0  BOOTDISK
 9-04-96  10:50a      <DIR>           0  IBMINST
 9-04-96  10:28a      <DIR>           0  IBMINST.BAK
 9-04-96  10:46a      <DIR>         353  Installed Features
 9-04-96  10:20a      <DIR>           0  RAMABIOS
 9-04-96  10:07a      <DIR>           0  VGA
        8 file(s)          0 bytes used


Directory of D:\OS2\INSTALL\Installed Features

 9-04-96  10:46a      <DIR>           0  .
 9-04-96  10:46a      <DIR>           0  ..
 9-04-96  10:46a      <DIR>         759  Install Object - Inventory
        3 file(s)          0 bytes used

Directory of D:\OS2\INSTALL\Installed Features\Install Object - Inventory

 9-04-96  10:46a      <DIR>           0  .
 9-04-96  10:46a      <DIR>           0  ..
 9-04-96  10:46a      <DIR>         372  ART - Inventory
 9-04-96  10:46a      <DIR>         338  COACHES - Inventory
 9-04-96  10:46a      <DIR>         339  DAXCOMP1 - Inventory
 9-04-96  10:46a      <DIR>         335  JAVA - Inventory
 9-04-96  10:46a      <DIR>         342  OS2BONUSPAK - Inventory
 9-04-96  10:46a      <DIR>         338  SRVDIAG - Inventory
 9-04-96  10:46a      <DIR>         351  SRVDOC - Inventory
 9-04-96  10:46a      <DIR>         337  SYSMGT - Inventory
       10 file(s)          0 bytes used

Directory of D:\OS2\MDOS

 9-04-96  10:07a      <DIR>           0  .
```

```
 9-04-96  10:07a     <DIR>           0  ..
 9-04-96  10:30a     <DIR>           0  WINOS2
        3 file(s)          0 bytes used

Directory of D:\OS2\MDOS\WINOS2

 9-04-96  10:30a     <DIR>           0  .
 9-04-96  10:30a     <DIR>           0  ..
 9-04-96  10:33a     <DIR>           0  SYSTEM
 9-04-96  10:34a     <DIR>           0  TEMP
        4 file(s)          0 bytes used

Directory of D:\OS2\PDPSI

 9-04-96  10:38a     <DIR>           0  .
 9-04-96  10:38a     <DIR>           0  ..
 9-04-96  10:38a     <DIR>           0  PMDF
        3 file(s)          0 bytes used

Directory of D:\OS2\PDPSI\PMDF

 9-04-96  10:38a     <DIR>           0  .
 9-04-96  10:38a     <DIR>           0  ..
 9-04-96  10:38a     <DIR>           0  WARP4
        3 file(s)          0 bytes used

        2 file(s)          0 bytes used

Directory of D:\OS2\POINTERS

 9-04-96  10:09a     <DIR>           0  .
 9-04-96  10:09a     <DIR>           0  ..
 9-04-96  10:14a     <DIR>         350  Aqua 3D Pointers
 9-04-96  10:14a     <DIR>         356  Big Black Pointers
 9-04-96  10:30a     <DIR>         368  Big Left-Handed Black Pointers
 9-04-96  10:30a     <DIR>         368  Big Left-Handed White Pointers
 9-04-96  10:14a     <DIR>         356  Big White Pointers
 9-04-96  10:09a     <DIR>         350  Blue 3D Pointers
 9-04-96  10:12a     <DIR>         350  Glove Pointers
 9-04-96  10:30a     <DIR>         350  Gold 3D Pointers
 9-04-96  10:30a     <DIR>         350  Gray 3D Pointers
 9-04-96  10:30a     <DIR>         352  Green 3D Pointers
 9-04-96  10:30a     <DIR>         364  Left-Handed Glove pointers
 9-04-96  10:30a     <DIR>         350  Pink 3D Pointers
 9-04-96  10:30a     <DIR>         348  Red 3D Pointers
 9-04-96  10:12a     <DIR>         355  Small Black Pointers
 9-04-96  10:30a     <DIR>         370  Small Left-Handed Black Pointers
 9-04-96  10:30a     <DIR>         370  Small Left-Handed White Pointers
 9-04-96  10:20a     <DIR>         355  Small White Pointers
       19 file(s)          0 bytes used

Directory of D:\OS2\SYSTEM

 9-04-96  10:07a     <DIR>           0  .
 9-04-96  10:07a     <DIR>           0  ..
 9-04-96  10:37a     <DIR>           0  RAS
 9-04-96  10:07a     <DIR>           0  TRACE
        4 file(s)          0 bytes used
```

Note

The above structure has been edited and serves only as an example. Your OS2 directory will be much larger than the above example.

B.2.10 The TCPIP Directory

The TCPIP directory contains all the TCP/IP applications and utilities. An example follows:

```
Directory of D:\tcpip

 9-04-96  11:11a     <DIR>           0  .
 9-04-96  11:11a     <DIR>           0  ..
 9-04-96  11:11a     <DIR>           0  archive
 9-04-96  11:11a     <DIR>           0  bin
 9-04-96  11:11a     <DIR>           0  dll
 9-04-96  11:12a     <DIR>           0  dos
 9-04-96  11:13a     <DIR>           0  etc
 9-04-96  11:11a     <DIR>           0  help
 9-04-96  11:11a     <DIR>           0  msg
 9-04-96  11:12a     <DIR>           0  pcomos2
 9-04-96  11:11a     <DIR>           0  samples
 9-04-96  11:11a     <DIR>           0  tmp
 9-04-96  11:12a     <DIR>           0  umail
      13 file(s)          0 bytes used

Directory of D:\tcpip\archive

 9-04-96  11:11a     <DIR>           0  .
 9-04-96  11:11a     <DIR>           0  ..
 9-04-96  11:11a     <DIR>           0  bin
 9-04-96  11:11a     <DIR>           0  dll
 9-04-96  11:11a     <DIR>           0  help
       5 file(s)          0 bytes used

Directory of D:\tcpip\dos

 9-04-96  11:12a     <DIR>           0  .
 9-04-96  11:12a     <DIR>           0  ..
 9-04-96  11:12a     <DIR>           0  bin
 9-04-96  11:12a     <DIR>           0  doc
 9-04-96  11:12a     <DIR>           0  etc
 9-04-96  11:12a     <DIR>           0  help
       6 file(s)          0 bytes used

Directory of D:\tcpip\msg

 9-04-96  11:11a     <DIR>           0  .
 9-04-96  11:11a     <DIR>           0  ..
 9-04-96  11:11a     <DIR>           0  enus850
       3 file(s)          0 bytes used

Directory of D:\tcpip\pcomos2

 9-04-96  11:12a     <DIR>           0  .
 9-04-96  11:12a     <DIR>           0  ..
 9-04-96  11:13a     <DIR>           0  info
 9-04-96  11:13a     <DIR>           0  samples
       4 file(s)          0 bytes used
```

```
Directory of O:\tcpip\samples

 9-04-96  11:11a     <DIR>           0  .
 9-04-96  11:11a     <DIR>           0  ..
 9-04-96  11:11a     <DIR>           0  etc
       3 file(s)          0 bytes used

Directory of D:\tcpip\samples\etc

 9-04-96  11:11a     <DIR>           0  .
 9-04-96  11:11a     <DIR>           0  ..
 9-04-96  11:11a     <DIR>           0  dbcsconv
       3 file(s)          0 bytes used


Directory of D:\tcpip\umail

 9-04-96  11:12a     <DIR>           0  .
 9-04-96  11:12a     <DIR>           0  ..
 9-04-96  11:13a     <DIR>           0  Server
       3 file(s)          0 bytes used

Directory of D:\tcpip\umail\Server

 9-04-96  11:13a     <DIR>           0  .
 9-04-96  11:13a     <DIR>           0  ..
 9-04-96  11:13a     <DIR>           0  InBox
 9-04-96  11:13a     <DIR>           0  NoWhere
 9-04-96  11:13a     <DIR>           0  Partial
       5 file(s)          0 bytes used
```

Note

The above directories are only a subset of the directories on your hard disk drive. Due to space considerations, we are unable to list the entire directory structure. To look at it, execute the following command on your hard disk drive drive:

```
DIR /S
```

or

```
DIR /S > output.file
```

This will give you a complete directory and file listing of your OS/2 Warp 4 system.

Appendix C. OS/2 Device Driver Pak CD

The OS/2 Device Driver Pak CD is designed to give you access to additional device drivers that are not included in the OS/2 Warp 4 operating system. The OS/2 Device Driver Pak CD gives you access to device drivers on the OS/2 Device Driver Pak CD and those on the World Wide Web. You will appreciate the fact that the drivers on the Internet could be newer than those on the OS/2 Device Driver Pak CD. To access the OS/2 Device Driver Pak CD online, point your Web browser to:

```
http://service.software.ibm.com/os2ddpak/
```

The OS/2 Device Driver Pak CD contains many device drivers in addition to those contained in the basic OS/2 Warp 4 package, and also contains links to Internet sites that provide many more device drivers. The OS/2 Device Driver Pak CD includes information on how to download and install device drivers on your OS/2 Warp 4 system, and therefore acts as a convenient single source of information for device drivers.

C.1 Installing the OS/2 Device Driver Pak CD

You can install the OS/2 Device Driver Pak CD as follows:

- Double-click on **OS/2 System**
- Double-click on **Drives**
- Double-click on CD-ROM Drive Icon
- Click on CD-ROM Base Directory
- Double-click on **INSTALL.CMD**

Upon completion of the installation procedure, you will find an OS/2 Device Driver Pak CD icon on your desktop. You can now access the OS/2 Device Driver Pak CD by double-clicking on this icon.

C.2 Using OS/2 Device Driver Pak CD

The OS/2 Device Driver Pak CD is organized as a series of Web pages, and uses the WebExplorer to assist you in finding information, not only on the OS/2 Device Driver Pak CD itself, but also on the World Wide Web, provided that you are connected to the Internet when using the OS/2 Device Driver Pak CD. You can use the OS/2 Device Driver Pak CD while you are not connected to the Internet, but any links from the OS/2 Device Driver Pak CD to Internet sites will not be accessible.

To start OS/2 Device Driver Pak CD, simply insert the CD-ROM into your CD-ROM drive, and double-click your left mouse button on the **OS/2 Device Driver Pak CD** icon. The WebExplorer will display the OS/2 Device Driver Pak CD - Home Page as shown in Figure 525 on page 988.

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Figure 525. IBM WebExplorer - OS/2 Device Driver Pak CD - Home Page

After reading this page, you can select an option from those shown on the page, just as if you were surfing the World Wide Web. You will be asked to agree to a *License Agreement*, after which you will arrive at the OS/2 Device Driver Pak CD - Device Categories page, as shown in Figure 526 on page 989.

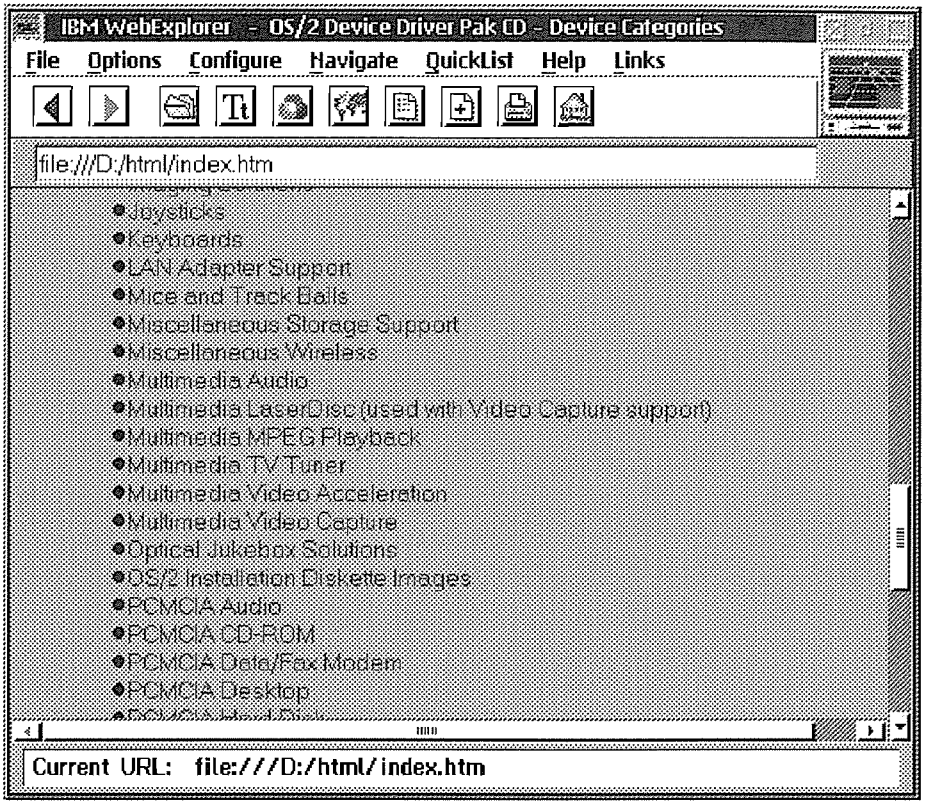

Figure 526. IBM WebExplorer - OS/2 Device Driver Pak CD - Device Categories

Select the device category in which you are interested, from the list of entries on this page.

You will then see the OS/2 Device Driver Pak CD - Companies page, which contains a list of companies that manufacture the type of device you selected. The OS/2 Device Driver Pak CD - Companies panel is shown in Figure 527 on page 990.

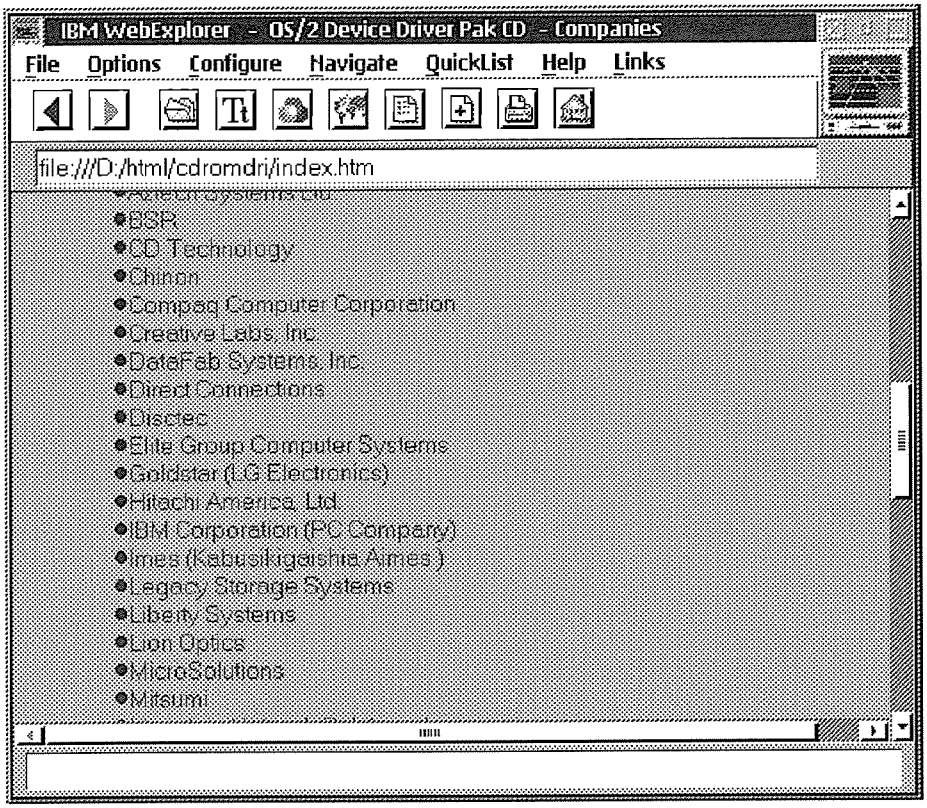

Figure 527. IBM WebExplorer - OS/2 Device Driver Pak CD - Companies

Select the company that manufactures the device for which you require a driver.

Next you will see the OS/2 Device Driver Pak CD - Products page. On this page, you should look for the particular device that you require. If the device for which you require a driver is listed on the OS/2 Device Driver Pak CD - Products page, select the corresponding entry in the list of products. The OS/2 Device Driver Pak CD - Products panel is shown in Figure 528 on page 991.

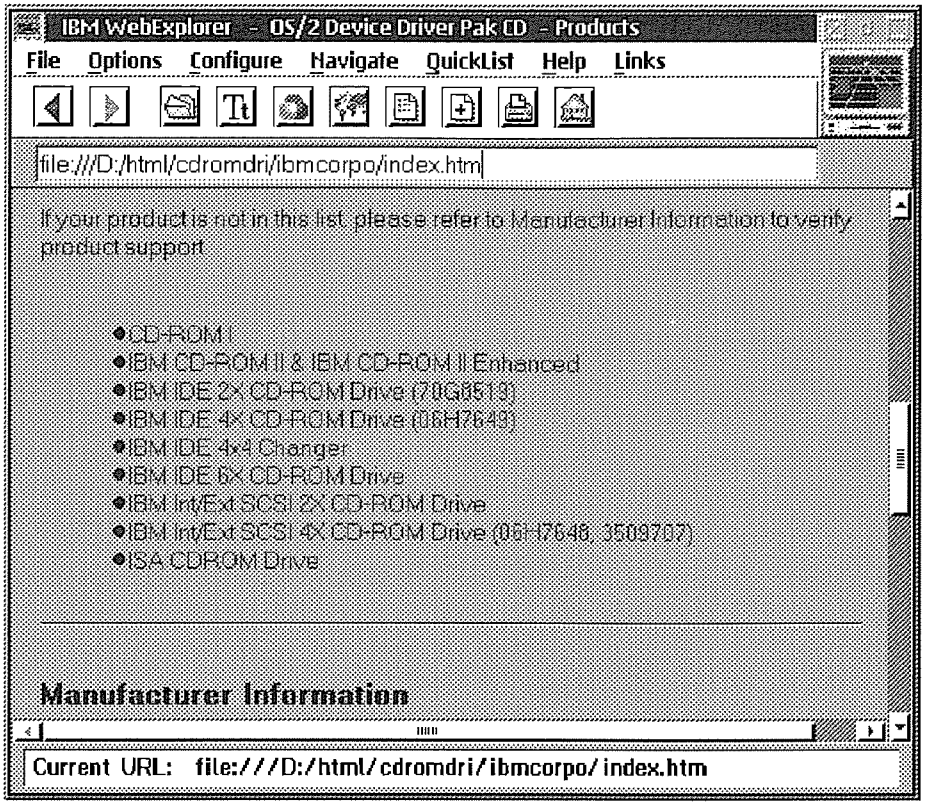

Figure 528. IBM WebExplorer - OS/2 Device Driver Pak CD - Products

You will now be presented with the OS/2 Device Driver Pak CD - Product Information page, which contains relevant information for the device you chose. The Driver Information section will contain the device driver itself, or information on how to obtain it. There is also a Manufacturer Information section on this page, which provides information and contact details for the manufacturer of the device.

If the device for which you require a driver is *not* listed on the OS/2 Device Driver Pak CD - Products page, you can use the information in the Manufacturer Information section to contact the manufacturer. Information provided in this section includes:

- World Wide Web site

  If you are connected to the World Wide Web, simply select the World Wide Web site listed and you will be taken to the Internet home page of the company that manufactures the device. From there you may be able to download the required driver, or find out if a driver is available.

- Technical support e-mail address

  If you are connected to the Internet, you can select this option and you will immediately be able to send an e-mail message to the company that manufactures the device.
- Technical support telephone number
- Bulletin Board telephone number
- Sales telephone number
- General enquiries telephone number

You can use this information to contact the manufacturer of the device, and determine whether they have a device driver that is compatible with your OS/2 Warp 4 system.

C.3 The OS/2 Device Driver Pak CD Online

If you use the online version of the OS/2 Device Driver Pak CD, point your Web browser to:

`http://service.software.ibm.com/os2ddpak/`

You will be presented with the OS/2 Device Driver Pak CD On-line - HOME PAGE, as illustrated in Figure 529 on page 993.

Figure 529. IBM WebExplorer - OS/2 Device Driver Pak CD On-Line - HOME PAGE

This is the home page of the online version of the OS/2 Device Driver Pak CD. It contains the same information as the CD version, although the online version could be more, and over time probably will be more, current. Usage of the online version of the OS/2 Device Driver Pak CD is exactly the same as for the CD version. Depending on how you are connected to the World Wide Web, your response times could be a lot slower than when using the CD version.

Appendix D. Win-OS/2 Audio Drivers

To enable audio support for most applications in DOS and Windows sessions, the following settings for DOS properties must be in effect:

- INT_DURING_IO = On
- VIDEO_RETRACE_EMULATION = Off
- AUDIO_ADAPTER_SHARING = Required

Be sure to check the settings for these DOS properties.

In most cases, when you install OS/2 support for your audio adapter, drivers for Windows audio support are also copied to your hard disk. To make this support available, you have to tell the Windows program where the audio drivers are located.

In the following sections we will examine the steps required to complete the installation of audio support in WIN-OS/2 for a number of popular audio adapters.

Also refer to Appendix C, "OS/2 Device Driver Pak CD" on page 987 for more information regarding OS/2 Warp 4 device drivers.

D.1 The IBM ThinkPad Audio-Crystal Semiconductor (CS4231)

To add Windows support for the IBM ThinkPad Audio-Crystal Semiconductor CS4231 audio devices, you need to:

- Edit the SYSTEM.INI file, which is located in the directory you load Windows from, usually the \OS2\MDOS\WINOS2 directory.

  Add the following lines under the heading [drivers]:

  - `WAVE=CS31BA11.DRV`
  - `Aux=CS31BA11.DRV`
  - `Mixer=CS31BA11.DRV`

  Add the following line under the heading [386enh]:

  ```
  device=vsndsys.386
  ```

  For ThinkPad 750 or 755 machines only, add the contents of the TP750INI.ADD file to the end of the SYSTEM.INI file. You can use your editor to perform this operation, or you can use the TYPE command. To use the TYPE command, enter the following at the command prompt:

  ```
  TYPE X:\OS2\DRIVERS\CSBSAUD\TP750INI.ADD >> C:\OS2\MDOS\WINOS2\SYSTEM.INI
  ```

  where X: is the drive that OS/2 is installed on and C: is the drive that Windows is installed on. Usually, X: and C: are the same drive.

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- Copy the Crystal Semiconductor CS4231 drivers from the \OS2 directory to the appropriate Windows directories.
  1. Copy CS31BA11.INI from \OS2\DRIVERS\CSBSAUD to \OS2\MDOS\WINOS2
  2. Copy CS31BA11.DRV from \OS2\DRIVERS\CSBSAUD to \OS2\MDOS\WINOS2\SYSTE
  3. Copy VSNDSYS.386 from \OS2\DRIVERS\CSBSAUD to \OS2\MDOS\WINOS2\SYSTE

D.2 The Crystal Semiconductor (CS4231)

To add Windows audio support for the Crystal Semiconductor CS4231 audio adapter, which is normally built-in to your system board, you need to:

- Edit the SYSTEM.INI file, which is located in the directory you load Windows from, usually the \OS2\MDOS\WINOS2 directory.

  Add the following lines in the [drivers] section:

  - `WAVE=cs31ba11.drv`
  - `AUX=cs31ba11.drv`
  - `MIXER=cs31ba11.drv`
  - `MIDI=opl3.drv`

  Under the heading [386Enh], add the following line:

  ```
  device=vsndsys.386
  ```

  Add the following heading and entries:

  - `[sndsys.drv]`
  - `Duplex=Half`
  - `SingleModeDMA=0`
  - `DMABufferSize=36`
  - `OldMSDosGameCompatibility=1`
  - `WatchMSDosExec=1`
  - `BlasterSupport=OTI929`
  - `Msft Hardware=1`
  - `Msft Support=1`
  - `Auto Select=1`
  - `Midi Play=1`
  - `EnableAutoAcquireOPL3=1`
  - `DMA 0=1`

- DMA 1=1
- DMA 3=1
- Default DMA=1
- I/O 530=1
- I/O 604=1
- I/O E80=1
- I/O F40=1
- Default I/O=530
- IRQ 7=1
- IRQ 9=1
- IRQ 10=1
- IRQ 11=1
- Default IRQ=7
- IOAddress=530
- DMAADC=1
- DMADAC=1
- Interrupt=11
- FMMixer=Aux2
- CDMixer=Aux1
- LineMixer=Aux1

The values for `IOAddress=` and `Interrupt=` must match the adapter settings. The values shown above are default values.

- Copy the Crystal Semiconductor CS4231 drivers from the \OS2 directory to the appropriate Windows directories.

  Copy the following files from the directory \OS2\DRIVERS\CSBSAUD to the directory \OS2\MDOS\WINOS2\SYSTEM:

  - CS31BA11.DRV
  - VSNDSYS.386
  - OEMSETUP.INF
  - OPL3.DRV
  - OPL3.CFG
  - MIDIMAP.CFG

Copy the file CS31BA11.INI from the directory \OS2\DRIVERS\CSBSAUD to the directory \OS2\MDOS\WINOS2.

D.3 The Crystal Semiconductor (CS4232)

To add Windows support for the Crystal Semiconductor CS4232 audio adapter, you need to:

- Edit the SYSTEM.INI file, which is located in the directory you load Windows from, usually the \OS2\MDOS\WINOS2 directory.

  Add the following lines under the heading [drivers]:

  - `WAVE=CS32BA11.DRV`
  - `Aux=CS32BA11.DRV`
  - `Mixer=CS32BA11.DRV`
  - `Midi=CSFM.DRV`

  Add the following line under the heading [386Enh]:

  ```
  device=vsndsys.386
  ```

  Add the following heading and entries:

  - `[csfm.drv]`
  - `protFM=388`
  - `int=0`

- Copy the Crystal Semiconductor CS4232 drivers from the \OS2 directory to the appropriate Windows directories.

  Copy the following files from the directory \OS2\DRIVERS\CSBSAUD to the directory \OS2\MDOS\WINOS2\SYSTEM:

  - CS32BA11.DRV
  - MIDIMAP.CFG
  - OEMSETUP.INF
  - OPL3.CFG
  - OPL3.DRV
  - CSFM.DRV
  - VSNDSYS.386

  Copy the file CS32BA11.INI from the directory \OS2\DRIVERS\CSBSAUD to the directory \OS2\MDOS\WINOS2.

D.4 The Crystal Semiconductor (CS4236)

To add Windows support for the Crystal Semiconductor CS4236 audio adapter, you need to:

- Edit the SYSTEM.INI file, which is located in the directory you load Windows from, usually the \OS2\MDOS\WINOS2 directory.

  Add the following lines under the heading [drivers]:

  - `WAVE=CS32BA11.DRV`
  - `Aux=CS32BA11.DRV`
  - `Mixer=CS32BA11.DRV`
  - `Midi=CSFM.DRV`

  Add the following line under the heading [386Enh]:

  `device=vsndsys.386`

  Add the following heading and entries:

  - [csfm.drv]
  - protFM=388
  - int=0

- Copy the Crystal Semiconductor CS4236 drivers from the \OS2 directory to the appropriate Windows directories.

  Copy the following files from the directory \OS2\DRIVERS\CSBSAUD to the directory \OS2\MDOS\WINOS2\SYSTEM:

  - CS32BA11.DRV
  - MIDIMAP.CFG
  - OEMSETUP.INF
  - OPL3.CFG
  - OPL3.DRV
  - CSFM.DRV
  - VSNDSYS.386

Copy the file CS32BA11.INI from the directory \OS2\DRIVERS\CSBSAUD to the directory \OS2\MDOS\WINOS2.

D.5 The IBM M-Audio (ACPADD2)

To add Windows audio support for the IBM M-Audio Adapter, start a Windows session as follows:

- Double-click on **Control Panel**

- Double-click on **Drivers**
- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**

In the Install Driver window type the path name of the driver, \OS2\DRIVERS\ACPADD2. The drive letter is the startup drive.

- Click on **OK**
- Click on **IBM M-Audio** sound driver
- Click on appropriate input and output sources
- Click on **OK**
- Restart the Windows session when requested

D.6 The Sound Blaster Non-Pro ISA or MCV

To add Windows audio support for the Sound Blaster Non-Pro ISA or MCV adapter, you need to edit the Windows SYSTEM.INI file and add two drivers to the list of installed drivers.

Edit the SYSTEM.INI file, which is located in the same directory you load Windows from, usually the \OS2\MDOS\WINOS2 directory. Add the following lines to the end of the file:

- `[sndblst.drv]`
- `Port=NNN`
- `Int=N`
- `DmaChannel=N`
- `MidiPort=NNN`

Where `N` and `NNN` are replaced by the proper numeric values acquired from the adapter manufacturer's documentation.

Add the drivers to the list of Windows installed drivers by following these steps:

- Double-click on **Control Panel**
- Double-click on **Drivers**
- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**

In the Install Driver window, type the path name of the driver. This is the \OS2\DRIVERS\SBD2 directory on the startup drive.

- Click on **OK**
- Click on **Creative Sound Blaster 2.0 MIDI Synthesizer**
- Click on **OK**
- If the Driver Exists window appears, select **New**
- Click on **OK** for the port address shown

Cancel the request to restart the Windows session so you can add the second driver.

- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**
- In the Install Driver window, select **OK**
- Click on **Creative Sound Blaster 2.0 Wave and MIDI**
- If the Driver Exists window appears, select **New**
- Restart the Windows session when requested

You should hear sound as the Windows session restarts. Now you can set up the MIDI mapper:

- Double-click on **Midi Mapper** in the Control Panel window
- Click on **MIDI Mapper Name, SBP All FM**
- Click on **Close**

D.7 The Sound Blaster Pro OPL2 (SBPD2)

To add Windows support for the Sound Blaster Pro OPL2 adapter, you need to add three drivers to the list of installed drivers. Before you add the drivers, you must edit the SYSTEM.INI file. This file is located in the same directory you load Windows from, usually the \OS2\MDOS\WINOS2 directory. Add the following lines to the end of the file:

- `[sndblst.drv]`
- `Port=NNN`
- `Int=N`
- `DmaChannel=N`
- `HDmaChannel=N`
- `MidiPort=NNN`

Where `N` and `NNN` are replaced by the proper numeric values acquired from the adapter manufacturer's documentation. Save the file and then add the drivers by following these steps:

- Double-click on **Control Panel in the Main Group**

- Double-click on **Drivers**
- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**

In the Install Driver window, type the path name of the driver. This is the \OS2\DRIVERS\SBPD2 directory on the startup drive.

- Click on **OK**
- Click on **Creative Sound Blaster Pro Auxiliary Audio**
- Click on **OK**
- If the Driver Exists window appears, select **New**
- Click on **OK** in the Sound Blaster Setup window

Cancel the request to restart the Windows session so you can add the second driver. To add the second driver:

- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**
- In the Install Driver window, select **OK**
- Click on **Creative Sound Blaster FM Driver**
- If the Driver Exists window appears, select **New**

Cancel the request to restart the Windows session so you can add the third driver. To add the third driver:

- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**
- In the Install Driver window, select **OK**
- Click on **Creative Sound Blaster Pro Wave and MIDI**
- If the Driver Exists window appears, select **New**
- Restart the Windows session when requested

You should hear sound as the Windows session restarts. Now you can set up the MIDI mapper:

- Double-click on **Control Panel** in the Main Group
- Double-click on **MIDI Mapper**
- Click on **MIDI Mapper Name, SBP All FM**

- Click on **Close**

D.8 The Sound Blaster Pro MCV or OPL3 (SBP2D2)

To add Windows audio support for the Sound Blaster Pro MCV or OPL3 adapter, you need to add three drivers to the list of installed drivers. Before you add the drivers, you must edit the SYSTEM.INI file. This file is located in the same directory you load Windows from, usually the \OS2\MDOS\WINOS2 directory. Add the following lines to the end of the file:

- `[sndblst.drv]`
- `Port=NNN`
- `Int=N`
- `DmaChannel=N`

where `N` and `NNN` are replaced by the proper numeric values acquired from the adapter manufacturer's documentation. After you save the file, you can add the drivers by following these steps:

- Double-click on **Control Panel** in the Main Group
- Double-click on **Drivers**
- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**

In the Install Driver window, type the path name of the driver. This is the \OS2\DRIVERS\SBP2D2 directory on the startup drive.

- Click on **OK**
- Click on **Creative Sound Blaster Pro Auxiliary Audio**
- If the Driver Exists window appears, select **New**

Cancel the request to restart the Windows session so you can add the second driver. To add the second driver:

- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**
- In the Install Driver window, select **OK**
- Click on **Creative Sound Blaster Pro Wave and MIDI**
- If the Driver Exists window appears, select **New**

Cancel the request to restart the Windows session so you can add the third driver. To add the third driver:

- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**
- In the Install Driver window, select **OK**
- Click on **Creative Sound Blaster FM Driver**
- If the Driver Exists window appears, select **New**
- Restart the Windows session when requested

You should hear sound as the Windows session restarts. Now you can set up the MIDI mapper:

- Double-click on **Control Panel** in the Main Group
- Double-click on **MIDI Mapper**
- Click on **MIDI Mapper Name, SBP All FM**
- Click on **Close**

D.9 The Sound Blaster 16

To add Windows audio support for the Sound Blaster 16, you need to edit the Windows SYSTEM.INI file and add three drivers to the list of installed drivers. First, edit the SYSTEM.INI file, which is located in the same directory you load Windows from, usually the \OS2\MDOS\WINOS2 directory. Add the following lines to the end of the file:

- `[sndblst.drv]`
- `Port=NNN`
- `Int=N`
- `DmaChannel=N`
- `HDmaChannel=N`
- `MidiPort=NNN`

Where `N` and `NNN` are replaced by the proper numeric values acquired from the adapter manufacturer's documentation. Second, add the drivers to the list of Windows installed drivers by following these steps:

- Double-click on **Control Panel** in the Main Group
- Double-click on **Drivers**
- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**

In the Install Driver window, type the path name of the driver. This is the \OS2\DRIVERS\SB16D2 directory on the startup drive.

- Click on **OK**
- Click on **Creative Sound Blaster 16 Auxiliary Audio**
- If the Driver Exists window appears, select **New**

Cancel the request to restart the Windows session so you can add the second driver. To add the second driver:

- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**
- In the Install Driver window, select **OK**
- Click on **Creative Sound Blaster FM Driver**
- If the Driver Exists window appears, select **New**

Cancel the request to restart the Windows session so you can add the third driver. To add the third driver:

- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**
- In the Install Driver window, select **OK**
- Click on **Creative Sound Blaster 16 Wave and MIDI**
- If the Driver Exists window appears, select **New**
- Restart the Windows session when requested

You should hear sound as the Windows session restarts. Now you can set up the MIDI mapper:

- Double-click on **Control Panel** in the Main Group
- Double-click on **MIDI Mapper**
- Click on **MIDI Mapper Name, SBP All FM**
- Click on **Close**

D.10 The Sound Blaster AWE 32

To install Windows audio support for the Sound Blaster AWE 32 adapter, you need to edit the SYSTEM.INI and SBWIN.INI files, and then add the drivers to the list of installed drivers:

- Edit the INI files

Add the following lines to the end of the SYSTEM.INI file, which is in the same directory you load Windows from, usually the \WINOS2 directory:

- `[sndblst.drv]`
- `Port=NNN`
- `Int=N`
- `DmaChannel=N`
- `DmaChannel=N`
- `MidiPort=NNN`

Where `N` and `NNN` are replaced by the proper numeric values acquired from the adapter manufacturer's documentation.

Copy the SBWIN.INI file from \OS2\DRIVERS\SBAWED2 to your \OS2\MDOS\WINOS2 directory.

Edit the SBWIN.INI file to reflect the drive letter where OS/2 is installed.

- Add the following drivers to the list of installed drivers To add the first driver:
  - Double-click on **Control Panel** in the Main Group
  - Double-click on **Drivers**
  - Click on **Add**
  - Click on **Unlisted or Updated Driver**
  - Click on **OK**

  In the Install Driver window type the path name of the driver. This is the \OS2\DRIVERS\SBAWED2 directory on the startup drive.

  - Click on **OK**
  - Click on **Creative Sound Blaster 16 MIDI Synthesizer**
  - If the Driver Exists window appears, select **New**

  Cancel the request to restart the Windows session so you can add the second driver. To add the second driver:

  - Click on **Add**
  - Click on **Unlisted or Updated Driver**
  - Click on **OK**
  - In the Install Driver window, select **OK**
  - Click on **Creative Sound Blaster 16 Wave and MIDI**
  - If the Driver Exists window appears, select **New**

  Cancel the request to restart the Windows session so you can add the third driver. To add the third driver:

- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**
- In the Install Driver window, select **OK**
- Click on **Creative Sound Blaster 16 Auxiliary Audio**
- If the Driver Exists window appears, select **New**

Cancel the request to restart the Windows session so you can add the third driver. To add the fourth driver:

- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**
- In the Install Driver window, select **OK**
- Click on **Sound Blaster AWE32 MIDI Driver**
- If the Driver Exists window appears, select **New**
- Restart the Windows session when requested

After you add the drivers, follow the instructions in the Sound Blaster setup window to select the proper port. You must be sure that any Windows session that uses the Sound Blaster AWE32 Windows audio drivers has the WINOS2 setting for WIN_RUN_MODE set to 3.1 Standard or you will not be able to start the session.

D.11 The Pro Audio Spectrum 16

To add Windows audio support for the Pro Audio Spectrum 16:

- Double-click on **Control Panel** in the Main Group
- Double-click on **Drivers**
- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**

In the Install Driver window, type the path name of the driver. This is the \OS2\DRIVERS\MVPRODD directory on the startup drive.

- Click on **OK**
- Click on **Pro Audio Spectrum/CDPC Wav/MIDI/AUX** driver
- If the Driver Exists window appears, select **New**
- Choose the settings that best suit your situation
- Restart the Windows session when requested

To enable audio recording, add the following line to the DOS_DEVICE setting for that session:

- `D:\OS2\DRIVERS\MVPRODD\MVSOUND.SYS D:PD`
- `Q:PI /S:SE,SP,SD,SI`

Where:

- `d:` is the letter of the drive where you installed OS/2
- `PD` is the PAS-16 DMA channel
- `PI` is the PAS-16 IRQ level
- `SE` is the Sound Blaster Enable/Disable setting (1=Enable, 0=Disable)
- `SP` is the Sound Blaster port address
- `SD` is the Sound Blaster DMA channel
- `SI` is the Sound Blaster IRQ level

D.12 The Media Vision Jazz 16

If you have a Media Vision Jazz 16 adapter, you need to add five drivers to the list of installed drivers. Before you add the drivers, you must change the setting for the DOS property, DOS_DEVICE.

The following line must be added to the DOS_DEVICE setting:

`d:\OS2\DRIVERS\JAZZDD\JAZZ.SYS Pnnn In Dn En Tnnn Qn`

Where `n` has the following meanings for audio-adapter settings:

- `Pnnn` is the I/O base address.
- `In` is the IRQ level.
- `Dn` is the 8-bit DMA channel.
- `En` is the 16-bit DMA channel.
- `Tnnn` is the MPU-401 base address.
- `Qn` is the MPU-401 IRQ level.
- `d:` is the drive where OS/2 is started from.

After you complete the changes to DOS settings, you are ready to add the drivers to the Windows Installed Drivers list. To add the first driver:

- Double-click on **Control Panel** in the Main Group
- Double-click on **Drivers**
- Click on **Add**
- Click on **Unlisted or Updated Driver**

- Click on **OK**

In the Install Driver window, type the path name of the driver. This is the \OS2\DRIVERS\JAZZDD directory on the startup drive.

- Click on **OK**
- Click on **Jazz Wave Audio**
- Ignore the error message
- Follow the installation instructions, selecting **New**
- Click on **OK**

Cancel the request to restart the Windows session so you can add the next driver. To add the second driver to the list:

- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**
- In the Install Driver window, select **OK**
- Click on **Jazz Mixer**
- Follow the installation instructions, selecting **New**

Cancel the request to restart the Windows session so you can add the next driver. To add the third driver to the list:

- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**
- In the Install Driver window, select **OK**
- Click on **Jazz-401 MIDI** Interface
- Follow the installation instructions, selecting **New**

Cancel the request to restart the Windows session so you can add the next driver. To add the fourth driver to the list:

- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**
- In the Install Driver window, select **OK**
- Click on **Jazz OPL2 FM Synth**
- Follow the installation instructions, selecting **New**

Cancel the request to restart the Windows session so you can add the next driver. To add the fifth driver to the list:

- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**
- In the Install Driver window, select **OK**
- Click on **Jazz OPL3 FM Synth**
- Follow the installation instructions, selecting **New**
- Restart the Windows section when requested

D.13 The Aztech Sound Galaxy NOVA 16 EXTRA

To add Windows audio support for the Aztech Sound Galaxy NOVA 16 EXTRA adapter:

- Double-click on **Control Panel** in the Main Group
- Double-click on **Drivers**
- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**

In the Install Driver window, type the path name of the driver. This is the \OS2\DRIVERS\AZT16DD directory on the startup drive.

- Click on **OK**
- Click on **16-bit Audio Driver**
- Ignore the error message
- Follow the installation instructions, selecting **New**
- Click on **OK**
- Restart the Windows session when requested

To set the MIDI Mapper for Aztech Sound Galaxy NOVA 16 EXTRA:

- Double-click on **Control Panel**
- Double-click on **MIDI Mapper**
- Click on **MIDI Mapper name, IBM FM SYN**
- Click on **Close**

D.14 The Aztech Sound Galaxy Wave32

To add Windows audio support for the Aztech Sound Galaxy Wave32 adapter:

- Double-click on **Control Panel** in the Main Group
- Double-click on **Drivers**

- Click on **Add**
- Click on **Unlisted or Updated Driver**
- Click on **OK**

In the Install Driver window, type the path name of the driver. This is the \OS2\DRIVERS\AZT32DD directory on the startup drive.

- Click on **OK**
- Click on **16-bit Audio Driver**
- Ignore the error message
- Follow the installation instructions, selecting **New**
- Click on **OK**
- Restart the Windows session when requested

D.15 The ESS-688

To install Windows audio support for the ESS-688 audio adapter, you need to do the following:

- Edit the SYSTEM.INI file. This file is in the same directory you load Windows from, usually the \OS2\MDOS\WINDOWS directory.

  In the [boot] section, change the "drivers=" entry to read:

  ```
  drivers=mmsystem.dll msmixmgr.dll
  ```

  In the [drivers] section, add the following entries:

  - `WAVE=es688win.drv`
  - `MIDI=es688win.drv`
  - `AUX=es688win.drv`
  - `MIXER=es688win.drv`
  - `MIDI1=audmpio.drv`

  Add the following heading and entry:

  - `[mciseq.drv]`
  - `disablewarning=true`

  In the [386Enh] section, add the following entry:

  ```
  device=es688win.386
  ```

  Create a new section for the audio driver with the following entries:

  - `[auddrive.drv]`
  - `AudioDrive=ES688`

- Synth=OPL3
- portchoices=220,230,240,250
- irqchoices=2,5,7,10
- dmachoices=0,1,3
- port=220
- int=7
- dmachannel=1
- AutoConfig=yes
- VerifyInt=yes
- VerifyDMA=no

The values for port=, int=, and dmachannel= must match the adapter settings.

- Remove the following entries (if they exist) from the CONTROL.INI file:

```
es688win.drv=
audmpio.drv=
```

- Copy all the files from the \OS2\DRIVERS\ES688DD directory to the \OS2\MDOS\WINOS2\SYSTEM directory.

Be sure that any Windows session that uses the ESS-688 Windows audio drivers has the WINOS2 setting for WIN_RUN_MODE set to 3.1 Standard or you will not be able to start the session.

D.16 The ESS-1688

To install Windows audio support for the ESS-1688 audio adapter, you need to do the following:

- Edit the SYSTEM.INI file.

  This file is located in the same directory you load Windows from, usually the \OS2\MDOS\WINOS2 directory.

  In the [boot] section, add the msmixmgr.dll string to the end of drivers= entry so that it looks like this:

  ```
  drivers=mmsystem.dll msmixmgr.dll
  ```

  In the [drivers] section, add the following entries:

  - WAVE=es1688wn.drv
  - MIDI=es1688wn.drv
  - AUX=es1688wn.drv
  - MIXER=es1688wn.drv

- MIDI1=audmpu.drv

Add the following heading and entry:

- [mciseq.drv]
- disablewarning=true

In the [386Enh] section, add the following entry:

device=es1688wn.386

Create a new section for the audio driver with the following entries:

- [auddrive.drv]
- mpu401=no
- AudioDrive=ES1688
- Synth=OPL3
- portchoices=220,230,240,250
- irqchoices=2,5,7,10
- dmachoices=0,1,3
- port=220
- int=7
- dmachannel=1
- AutoConfig=yes
- VerifyInt=yes
- VerifyDMA=no

The values for port=, int=, and dmachannel= must match the adapter settings.

- Remove the following entries (if they exist) from the CONTROL.INI file.
  - [drivers.desc]
  - es1688wn.drv=
  - audmpio.drv=
- Copy all the files from the \OS2\DRIVERS\ES1688DD directory to the \OS2\MDOS\WINOS2\SYSTEM directory.

You must be sure that any Windows session that uses the ESS-1688 Windows audio drivers has the WINOS2 setting for WIN_RUN_MODE set to 3.1 Enhanced Compatibility or you will not be able to use the audio drivers.

D.17 The ESS-1788

To install Windows audio support for the ESS-1788 audio adapter, you need to do the following:

- Edit the SYSTEM.INI file. This file is located in the same directory you load Windows from, usually the \OS2\MDOS\WINOS2 directory.

  In the [boot] section, add the `msmixmgr.dll` string to the end of `drivers=` entry so that it looks like this:

  ```
  drivers=mmsystem.dll msmixmgr.dll
  ```

  In the [drivers] section, add the following entries:

  - `WAVE=es1788wn.drv`
  - `MIDI=es1788wn.drv`
  - `AUX=es1788wn.drv`
  - `MIXER=es1788wn.drv`
  - `MIDI1=audmpu.drv`

  Add the following heading and entry:

  - `[mciseq.drv]`
  - `disablewarning=true`

  In the [386Enh] section, add the following entry:

  ```
  device=es1788wn.386.
  ```

  Create a new section for the audio driver with the following entries:

  - `[auddrive.drv]`
  - `mpu401=no`
  - `AudioDrive=ES1788`
  - `essdaemon=yes`
  - `ControlRegisterAddressing=FALSE`
  - `AudioDrive=ES1788`
  - `Synth=OPL3`
  - `portchoices=220,230,240,250`
  - `irqchoices=2,5,7,10`
  - `dmachoices=0,1,3`
  - `port=220`
  - `int=7`
  - `dmachannel=1`

- portchoicesMPU401=300,310,320,330
- irqchoicesMPU401=2,5,7,10,11
- portMPU401=300
- intMPU401=7
- AutoConfig=yes
- VerifyInt=yes
- VerifyDMA=no

The values for port=, int=, and dmachannel= must match the adapter settings.

- Remove the following entries (if they exist) from the CONTROL.INI file.
  - [drivers.desc]
  - es1788wn.drv=
  - audmpio.drv=
- Copy all the files from the \OS2\DRIVERS\ES1788DD directory to the \OS2\MDOS\WINOS2\SYSTEM directory.

You must be sure that any Windows session that uses the ESS-1788 Windows audio drivers has the WINOS2 setting for WIN_RUN_MODE set to 3.1 Enhanced Compatibility or you will not be able to use the audio drivers.

D.18 The ESS-1868

To install Windows audio support for the ESS-1868 audio adapter, you need to do the following:

- Edit the SYSTEM.INI file. This file is located in the same directory you load Windows from, usually the \OS2\MDOS\WINOS2 directory.

  In the [boot] section, add the msmixmgr.dll string to the end of drivers= entry so that it looks like this:

  ```
  drivers=mmsystem.dll msmixmgr.dll
  ```

  In the [drivers] section, add the following entries:

  - WAVE=es1868wn.drv
  - MIDI=es1868wn.drv
  - AUX=es1868wn.drv
  - MIXER=es1868wn.drv
  - MIDI1=audmpu.drv

  Add the following heading and entry:

  - [mciseq.drv]

- disablewarning=true

In the [386Enh] section, add the following entry:

```
device=es1868wn.drv
```

Create a new section for the audio driver with the following entries:

- [auddrive.drv]
- mpu401=yes
- essdaemon=yes
- ControlRegisterAddressing=FALSE
- AudioDrive=ES1868
- Synth=OPL3
- portchoices=220,230,240,250
- irqchoices=5,7,9,10,11,15
- dmachoices=0,1,3
- port=220
- int=9
- dmachannel=1
- portchoicesMPU401=300,310,320,330
- irqchoicesMPU401=5,7,9,10,11,15
- portMPU401=300
- intMPU401=7
- DMAChoicesWave2=0,1,3
- DMAChannelWave2=3
- AutoConfig=yes
- VerifyInt=yes
- VerifyDMA=no

The values for port=, int=, and dmachannel= must match the adapter settings.

- Remove the following entries (if they exist) from CONTROL.INI file.
  - [drivers.desc]
  - es688win.drv=
  - audmpio.drv=
- Copy all the files from the \OS2\DRIVERS\ES1868DD directory to the \OS2\MDOS\WINOS2\SYSTEM directory.

You must be sure that any Windows session that uses the ESS-1868 Windows audio drivers has the WINOS2 setting for WIN_RUN_MODE set to 3.1 Enhanced Compatibility or you will not be able to use the audio drivers.

D.19 The ESS-1888

To install Windows audio support for the ESS-1888 audio adapter, you need to do the following:

- Edit the SYSTEM.INI file. This file is located in the same directory you load Windows from, usually the \OS2\MDOS\WINOS2 directory.

  In the [boot] section, add the `msmixmgr.dll` string to the end of `drivers=` entry so that it looks like this:

  ```
  drivers=mmsystem.dll msmixmgr.dll
  ```

  In the [drivers] section, add the following entries:

  - `WAVE=es1888wn.drv`
  - `MIDI=es1888wn.drv`
  - `AUX=es1888wn.drv`
  - `MIXER=es1888wn.drv`
  - `MIDI1=audmpu.drv`

  Add the following heading and entry:

  - `[mciseq.drv]`
  - `disablewarning=true`

  In the [386Enh] section, add the following entry:

  ```
  device=es1888wn.386
  ```

  Create a new section for the audio driver with the following entries:

  - `[auddrive.drv]`
  - `mpu401=yes`
  - `essdaemon=yes`
  - `ControlRegisterAddressing=FALSE`
  - `AudioDrive=ES1888`
  - `Synth=OPL3`
  - `portchoices=220,230,240,250`
  - `irqchoices=2,5,7,10`
  - `dmachoices=0,1,3`
  - `port=220`

- int=7
- dmachannel=1
- portchoicesMPU401=300,310,320,330
- irqchoicesMPU401=2,5,7,10,11
- portMPU401=300
- intMPU401=7
- IRQChoicesWave2=11,12,15
- DMAChoicesWave2=0,5,6
- IntWave2=12
- DMAChannelWave2=5
- AutoConfig=yes
- VerifyInt=yes
- VerifyDMA=no

The values for port=, int=, and dmachannel= must match the adapter settings.

- Remove the following entries (if they exist) from CONTROL.INI file.
  - [drivers.desc]
  - es1888win.drv=
  - audmpio.drv=
- Copy all the files from the \OS2\DRIVERS\ES1888DD directory to the \OS2\MDOS\WINOS2\SYSTEM directory.

You must be sure that any Windows session that uses the ESS-1888 Windows audio drivers has the WINOS2 setting for WIN_RUN_MODE set to 3.1 Enhanced Compatibility or you will not be able to use the audio drivers.

Appendix E. DOS and WIN-OS/2 Settings

This appendix describes each of the DOS and WIN-OS/2 settings that you that can be individually configured within the OS/2 Warp 4 environment for a DOS or Windows to run. The information is provided according to the order of the setting category, and then by alphabetical order within each category.

E.1 Keyboard Settings

These settings allow you to control the way in which OS/2 Warp 4 responds to special keystrokes. Using these settings, you can instruct OS/2 Warp 4 to trap or ignore particular keystrokes, and allow your applications to run more smoothly.

E.1.1 KBD_ALTHOME_BYPASS

Registered by: VDD VKBD.SYS as a default VDD.

By default, OS/2 Warp 4 uses the Alt+Home hot-key sequence to switch between full-screen and windowed mode in a DOS VDM. However, your application may use this key sequence for some task or command within the application itself. Setting KBD_ALTHOME_BYPASS to ON allows your application to use the Alt+Home key sequence.

If you wish to switch between full-screen and windowed mode for a VDM that has this setting turned ON, you will need to use Ctrl+Esc to go to the Window List, then use the pop-up menus in the window list to switch modes.

E.1.2 KBD_BUFFER_EXTEND

Registered by: VDD VKBD.SYS as a default VDD.

Use this setting to increase the size of the keyboard type-ahead buffer for a session. The default keyboard buffer size for each VDM is 16 bytes. If your application processes a lot of text (for example, if you have a word processing application), you may need to increase the size of the buffer to avoid overflowing. Setting KBD_BUFFER_EXTEND to ON increases the buffer size to 128 bytes.

E.1.3 KBD_CTRL_BYPASS

Registered by: VDD VKBD.SYS as a default VDD.

Use this setting to have OS/2 Warp 4 ignore one or more control-key sequences so that your DOS or Windows program can use that sequence. For example, you can specify that OS/2 Warp 4 should ignore Ctrl+Esc, so this sequence will be passed to your application and can be interpreted by the application as a command.

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When KBD_CTRL_BYPASS is set to OFF (the default), any control-key sequences that you enter are first checked by OS/2 Warp 4 to see if they are defined to the operating system. If so, they are processed by OS/2 Warp 4 and are not passed to your application. Setting KBD_CTRL_BYPASS to ON and specifying particular control-key sequences instructs OS/2 Warp 4 to pass these sequences directly to your application.

E.1.4 KBD_RATE_LOCK

Registered by: VDD VKBD.SYS as a default VDD.

Use this setting to prevent a session from changing the system keyboard repeat rate. Some DOS applications modify the keyboard repeat rate when they start up. Setting KBD_RATE_LOCK to ON instructs OS/2 Warp 4 to ignore any such commands from the application, and helps keep the same keyboard repeat-rate among all sessions in your OS/2 Warp 4 system.

E.2 Memory Settings

The following settings can be used to specify how memory should be allocated for a specific VDM. This is useful for ensuring that your applications have sufficient memory, while maintaining the overall performance of your OS/2 Warp 4 system.

E.2.1 DOS_HIGH

Registered by: VDD VBIOS.SYS as a default VDD.

Set DOS_HIGH to ON if you want OS/2's DOS emulation kernel loaded into the high memory area (HMA) above 1 MB, allowing more memory for DOS programs and devices. This is equivalent to the DOS=HIGH statement in CONFIG.SYS when running under DOS.

Some older DOS applications assume that DOS will never be loaded in the high memory area, and define a fixed location for the DOS kernel. Making DOS run in high memory invalidates the assumptions of these applications, and can cause unpredictable results if the area being modified is used by another DOS application. You should therefore be careful when setting DOS_HIGH to ON.

E.2.2 DOS_RMSIZE

Registered by: VDD VBIOS.SYS as a default VDD.

Use this setting if you want to set the base memory size of a VDM to less than 640 KB. This is useful when running certain DOS applications, which cannot handle having 640 KB free. When running such applications, their calculations for determining segment loading addresses will overflow due to OS/2 Warp 4 providing *too much* free memory in the VDM address space.

For example, PC/ACL is one such application. PC/ACL must have 512 KB or less of memory when loading, or its internal segment load calculations will overflow and the application will crash.

E.2.3 DOS_UMB

Registered by: VDD VBIOS.SYS as a default VDD.

Use this setting to load DOS TSRs and devices into upper memory blocks with the LOADHIGH and DEVICEHIGH commands.

Use this setting if you will load a device driver or memory resident program (also known as a Terminate and Stay Resident program or TSR) that must own and manage upper memory blocks (UMBs). The DEVICEHIGH and LOADHIGH commands in CONFIG.SYS work only when DOS owns upper memory blocks. Note that the memory area available for UMBs can become reduced if expanded memory specification (EMS) and extended memory specification (XMS) memory limits are set too high.

E.2.4 DPMI_DOS_API

Registered by: VDD VDPX.SYS as an installable VDD.

Use this setting to control whether the application running in this VDM can access memory above 640 KB using the DPMI interface.

Note that most Windows 3.1 applications use the DPMI interface. You should therefore set DPMI_DOS_API to ENABLED or AUTO for Windows applications. For other applications that do not use DPMI, however, you can set DPMI_DOS_API to DISABLED and save some additional memory in the VDM's address space.

E.2.5 DPMI_MEMORY_LIMIT

Registered by: VDD VDPMI.SYS as an installable VDD.

Use this setting to specify the amount of DPMI memory, in megabytes, available for applications running in this VDM. Set the limit to zero to disable the DPMI interface for this VDM.

If a Windows application is running out of resources, it may mean that you have DPMI_MEMORY_LIMIT set too low. It is best to set DPMI_MEMORY_LIMIT higher than necessary. Only the amount of DPMI memory that is needed will actually be allocated, so setting a high value does not hinder your system's available resources.

E.2.6 DPMI_NETWORK_BUFF_SIZE

Registered by: VDD VDPX.SYS as an installable VDD.

Use this setting to control the size, in kilobytes, of the network translation buffer for DPMI applications in this VDM.

This value should be provided with the network software you are running.

E.2.7 EMS_FRAME_LOCATION

Registered by: VDD VEMM.SYS as an installable VDD.

Use this setting to change the location of the 64 KB expanded memory specification (EMS) frame. This is only necessary if the default location of the EMS frame conflicts with the requirements of DOS device drivers that you want to load into this VDM.

E.2.8 EMS_HIGH_OS_MAP_REGION

Registered by VDD VEMM.SYS as an installable VDD.

Use this setting to adjust the amount of memory that a DOS program can add to the EMS region.

E.2.9 EMS_LOW_OS_MAP_REGION

Registered by VDD VEMM.SYS as an installable VDD.

Use this setting if your program can use remappable conventional memory and you want to set the size of the remappable conventional memory available to a DOS application.

E.2.10 EMS_MEMORY_LIMIT

Registered by: VDD VEMM.SYS as an installable VDD.

Use this setting to adjust the amount of EMS memory, in kilobytes, available to a DOS application running in this VDM. Note that you should not set EMS_MEMORY_LIMIT too high, since some older applications will request and initialize all the available memory upon startup, placing an unnecessary workload on your system and affecting performance.

E.2.11 MEM_EXCLUDE_REGIONS

Registered by: VDD VBIOS.SYS as a default VDD.

Use this setting to specify regions that expanded memory specification (EMM) and extended memory specification (XMS) must not use because they are needed for device drivers or other requirements. Some DOS applications and adapters specify areas in the area between 640 KB and 1 MB, which they reserve for their own use. Specifying such regions reduces the chances of memory being overwritten within the VDM, which might result in device driver failure.

E.2.12 MEM_INCLUDE_REGIONS

Registered by: VDD VBIOS.SYS as a default VDD.

Use this setting to specify regions between 640 KB and 1 MB that EMS and XMS applications will always be able to use. Specifying such regions is typically only

necessary when you are running device drivers or TSRs that require UMB space, and is then used in conjunction with MEM_EXCLUDE_REGIONS to specify the areas that applications may use.

E.2.13 XMS_HANDLES

Registered by: NA

Use this setting to adjust the number of handles needed to identify blocks of XMS memory. Reducing the number of pre-allocated handles frees memory space in the VDM for other uses.

E.2.14 XMS_MEMORY_LIMIT

Registered by: NA

Use this setting to adjust the amount of XMS memory, in kilobytes, available to a DOS application running in this VDM.

E.2.15 XMS_MINIMUM_HMA

Registered by: NA

Use this setting to adjust the minimum amount of memory in the high memory area (HMA) available for use as conventional memory.

E.3 Mouse and Touch Screen Settings

A DOS application may occasionally control the mouse or a touch screen in a way that duplicates or conflicts with OS/2 Warp 4's own handling of these devices. These settings allow you to prevent such conflicts and run these applications correctly under OS/2 Warp 4.

E.3.1 MOUSE_EXCLUSIVE_ACCESS

Registered by: VDD VMOUSE.SYS as an installable VDD.

Some DOS applications require exclusive ownership of the mouse, and create their own mouse pointer. If you are executing a DOS application and notice two mouse pointers on the screen, set MOUSE_EXCLUSIVE_ACCESS to ON, then click the mouse in the DOS window to remove the extra mouse pointer.

E.3.2 TOUCH_EXCLUSIVE_ACCESS

Registered by: NA

If a program running in a VDM in windowed mode does not respond properly when you touch a touch-sensitive display, set TOUCH_EXCLUSIVE_ACCESS to ON.

Note that you do not need this setting for a program running in a full-screen VDM.

E.4 Printer Settings

The following settings allow you to control the behavior of print jobs initiated by DOS or Windows applications.

E.4.1 PRINT_SEPARATE_OUTPUT

Registered by: NA

If you run more than one program in a single VDM (for example, Windows applications sharing a common WIN-OS/2 session), you should set PRINT_SEPARATE_OUTPUT to ON, in order to separate print jobs sent from different programs into separate spool files.

E.4.2 PRINT_TIMEOUT

Registered by: VDD VLPT.SYS as a default VDD.

When you send a print job to a printer under OS/2 Warp 4, the print spooler waits for an indication that the print job is complete before it closes the spool file and sends the job to the printer. This indication normally takes the form of an end-of-job character. However, some DOS applications do not send such a character since they assume that they are running under DOS, are the only task running in the system, and therefore have complete control over the hardware.

In such cases, the OS/2 Warp 4 print spooler could be left waiting indefinitely for the end-of-job character. To avoid this, you can use the PRINT_TIMEOUT setting to instruct OS/2 Warp 4 to monitor the print queue and after a certain amount of idle time, during which no print data has been sent from the application, automatically end the print job.

The PRINT_TIMEOUT setting specifies the amount of time, in seconds, that OS/2 Warp 4 should wait before automatically closing the spool file and sending the print job to the printer.

If you set this value to zero, the spool file does not close until:

- The DOS program ends
- You terminate the VDM
- You press Crtl+Alt+Print Screen

Any of these events will automatically close the spool file, at which point the OS/2 Warp 4 print spooler will send the job to the printer.

E.5 Video Settings

These settings allow you to control the behavior of the interface between the display screen and your DOS and Windows applications.

E.5.1 VIDEO_8514A_XGA_IOTRAP

Registered by: NA

Certain applications show better performance when they are allowed uncontrolled access to the video device. By default, OS/2 Warp 4 controls access to the display screen and adapter on the application's behalf, but you can use this setting to provide faster, unrestricted access for games and graphical applications. Set the value to OFF so that the DOS applications can directly access all functions of the video device for better video performance.

Note that this setting has no effect on windowed DOS VDMs or a full-screen VDM running in the background.

E.5.2 VIDEO_FASTPASTE

Registered by: VDD VVIDEO.SYS as a default VDD.

Use this setting to speed up input from sources other than the keyboard, such as text pasted from the clipboard. When VIDEO_FASTPASTE is set to ON, your clipboard operations get a higher proportion of processor time to transfer the data quickly. Applications using clipboard functions without this setting enabled may experience delayed transfer of data from Presentation Manager to WIN-OS/2, or WIN-OS/2 to WIN-OS/2.

E.5.3 VIDEO_MODE_RESTRICTION

Registered by: VDD VVIDEO.SYS as a default VDD.

Some text-based DOS applications do not require all-points-addressable (APA) graphics support in the VDM. You can use the VIDEO_MODE_RESTRICTION to turn off APA graphics support in a VDM, thereby recovering additional memory for use by your applications and data.

VIDEO_MODE_RESTRICTION allows you to extend DOS conventional memory *beyond* 640 KB by limiting the video mode support to text or CGA graphics only. If you set VIDEO_MODE_RESTRICTION to MONO or CGA, OS/2 Warp 4 limits the memory set aside for video to 16 KB for CGA or 4 KB for MONO, rather than the default of 64 KB. Your application can then use the additional memory.

For example, by setting VIDEO_MODE_RESTRICTION to CGA, you can increase the amount of free memory in a VDM to 736 KB. Selectively disabling memory extenders such as DPMI, EMS, or XMS can increase this amount even further, to approximately 760 KB.

E.5.4 VIDEO_ONDEMAND_MEMORY

Registered by: VDD VVIDEO.SYS as a default VDD.

Use this setting to delay allocation of a video-save buffer, which can free memory for use by a full-screen DOS session. Setting VIDEO_ONDEMAND_MEMORY to ON may slow initial swapping of video memory, but it may provide the fine-tuning needed to give more space to your full-screen DOS session.

E.5.5 VIDEO_RETRACE_EMULATION

Registered by: VDD VVIDEO.SYS as a default VDD.

Use this setting to allow simulation of video retrace which improves text scrolling speed. Disabling this setting forces retrace to occur only in the intervals requested by the DOS program.

Setting VIDEO_RETRACE_EMULATION to OFF can free processor time that would otherwise be consumed to perform the simulated video retrace when your DOS program does not really need it. However, some graphics-intensive DOS applications may experience video corruption when VIDEO_RETRACE_EMULATION is set to OFF, such as intermittent "snow" in some areas on the screen.

Note that this setting applies only to full-screen VDMs running in the foreground. It has no effect on windowed VDMs or full-screen VDMs running in the background.

E.5.6 VIDEO_ROM_EMULATION

Registered by: NA

Use this setting to emulate some text-based video ROM functions for improved performance and codepage support. You should set VIDEO_ROM_EMULATION to OFF if your video adapter's ROM adds enhancements to these functions.

Note that this setting only applies to full-screen VDMs. It has no effect on windowed VDMs.

E.5.7 VIDEO_SWITCH_NOTIFICATION

Registered by: NA

When VIDEO_SWITCH_NOTIFICATION is set ON, OS/2 Warp 4 notifies the DOS program when the session switches to or from full-screen mode.

E.5.8 VIDEO_WINDOW_REFRESH

Registered by: NA

Use this setting to adjust the update frequency, in tenths of seconds, for a specific DOS VDM.

This setting applies only to windowed VDMs. It has no effect on updates that are a result of keyboard input or scrolling and has no effect on DOS full-screen sessions.

E.6 Other DOS Settings

The following settings allow you to better allocate the resources of your system, both hardware and software, and thereby improve overall performance of your OS/2 Warp 4 system.

E.6.1 AUDIO_ADAPTER_SHARING

Registered by: NA

Two applications cannot use the same audio adapter at the same time, at least not without creating an awful noise. In addition, some DOS programs attempt to use an audio adapter even if one is not required to run the program.

This setting allows you to minimize conflicts by defining audio adapter requirements for a VDM:

- Select **Optional** to indicate that a program in this VDM should use an audio adapter if one is available.
- Select **Required** to indicate that a program in this VDM session *must* have access to an audio adapter. When this setting is selected, OS/2 Warp 4 will display an error message if you try to start this VDM while the audio adapter is being used by another program.
- Select **None** to indicate that a program in this VDM does not require an audio adapter.

E.6.2 COM_DIRECT_ACCESS

Registered by: VDD VCOM.SYS as an installable VDD.

Setting COM_DIRECT_ACCESS to ON allows a program running in this VDM to access serial ports directly, without OS/2 Warp 4 providing an intervening interface. Such control is often useful to ensure the best performance for DOS or Windows communications applications.

E.6.3 COM_HOLD

Registered by: VDD VCOM.SYS as an installable VDD.

Some applications use more than one program. For example, a communications application may use one program to set port speeds and initialize a serial port, then use another program to actually perform the communication.

Since OS/2 Warp 4 allows sharing of serial ports, you could find yourself in a situation where, when running multiple communications applications, an application initializes a

port, only to find that the port is then taken over by another application. This is because OS/2 Warp 4 monitors the ports and releases a port when a program ends, or when the port has been inactive for some time.

To avoid such a situation, you can use COM_HOLD to ensure that once a port is allocated to a VDM, the VDM maintains control over that port until the VDM terminates. When COM_HOLD is set to ON, OS/2 Warp 4 ignores any program terminations or time-out conditions within this VDM. The port will only be released when you terminate the VDM.

E.6.4 COM_RECEIVE_BUFFER_FLUSH

Registered by: NA

Use this setting to control the content of the received data buffers when a VDM is switched to the foreground, or when a DOS program enables the received data interrupt.

E.6.5 COM_SELECT

Registered by: VDD VCOM.SYS as an installable VDD.

Some communications applications attempt to access the first available serial port. If you want to restrict an application to using one particular serial port, you can use COM_SELECT to limit access to the selected COM port for this VDM.

E.6.6 DOS_AUTOEXEC

Registered by: DOSKRNL.

Use this setting to specify the name of a batch file that will be executed during startup of a VDM. The default is \AUTOEXEC.BAT in the root directory of your boot drive.

This setting allows you to set up a unique batch file for each VDM in your system. It also permits you to pass parameters to your AUTOEXEC.BAT file.

Note that leaving DOS_AUTOEXEC blank will cause no batch file to be executed during the startup of this VDM; that is, AUTOEXEC.BAT will *not* be executed.

E.6.7 DOS_BACKGROUND_EXECUTION

Registered by: VDD VTIMER.SYS as a default VDD.

Use this setting to allow a DOS program to run in the background. When DOS_BACKGROUND_EXECUTION is set to OFF, a DOS program will be suspended whenever you switch to another program or session.

For games, you should normally set DOS_BACKGROUND_EXECUTION to OFF. This will ensure that the aliens do not unexpectedly eat you while you are entering data into your spreadsheet.

You should always set DOS_BACKGROUND_EXECUTION to ON for communications programs and Windows programs that perform Dynamic Data Exchange (DDE), since such programs must always be able to receive data, even when you are working with another program.

E.6.8 DOS_BREAK

Registered by: VDD VBIOS.SYS as a default VDD.

Use this setting to activate Ctrl+C (or Ctrl+Break) as a break character in this VDM.

This is the same as the BREAK=ON or OFF in your CONFIG.SYS file under native DOS. When you set DOS_BREAK to ON, the Ctrl+C or Ctrl+Break key sequences are checked during every file system request made by your DOS application. This can be useful if you have a program that appears to ignore the keyboard when you want to stop it running. When you set DOS_BREAK to OFF, the Ctrl+C or Ctrl+Break are checked only during I/O calls to the file system.

E.6.9 DOS_DEVICE

Registered by: VDD VBIOS.SYS as a default VDD.

Use this setting to specify DOS device drivers that should be loaded into a VDM. You must enter the full path and file name for each driver. Note that you *should not* include the `DEVICE=` statement before each driver.

Only character device drivers are supported within a VDM. Block device drivers, such as hard disk device drivers, are not supported.

Note that you should include only those DOS device drivers that are required for the particular DOS programs that will run in this VDM. Including additional device drivers will use up memory within the VDM's address space that could otherwise be used by your applications and data.

If you want to load a DOS device driver into all VDMs in your OS/2 Warp 4 system, you *should not* use DOS_DEVICE. Instead, place a `DEVICE=` statement for the DOS device driver in your OS/2 Warp 4 CONFIG.SYS file, just as you would in a native DOS or Windows system.

E.6.10 DOS_FCBS

Registered by: VDD VBIOS.SYS as a default VDD.

Use this setting to specify the maximum number of file control blocks (FCBs) that can be opened concurrently in this VDM. This setting affects only file-sharing modules.

Note that most modern DOS and Windows applications do not use FCBs. The use of FCBs primarily relates to applications written to run on a DOS version before DOS 2.0. Most applications written to run on DOS 2.0 or higher use file handles.

E.6.11 DOS_FCBS_KEEP

Registered by: VDD VBIOS.SYS as a default VDD.

Use this setting to set aside a number of file control blocks (FCBs) that OS/2 Warp 4 must not close to make room for opening another file.

Note that most modern DOS and Windows applications do not use FCBs. The use of FCBs primarily relates to applications written to run on a DOS version before DOS 2.0. Most applications written to run on DOS 2.0 or higher use file handles.

E.6.12 DOS_FILES

Registered by: VDD VBIOS.SYS as a default VDD.

Use this setting to specify the maximum number of files that can be opened in this VDM. This is analogous to the `FILES=` statement in CONFIG.SYS under native DOS.

The DOS_FILES setting overrides the `FILES=` statement in your OS/2 Warp 4 CONFIG.SYS file. This statement provides the default setting for all VDMs in your OS/2 Warp 4 system, but you can override the default for an individual VDM using DOS_FILES.

E.6.13 DOS_LASTDRIVE

Registered by: VDD VBIOS.SYS as a default VDD.

Use this setting to identify the highest logical drive letter available to this VDM. This is analogous to the `LASTDRIVE=` statement in CONFIG.SYS under native DOS.

Some DOS applications, such as LAN requesters, expect to reserve the logical driver letters following the LASTDRIVE for private use. If you run such applications in a VDM, you may need to alter the default setting of Z, since this default may cause such applications to fail.

E.6.14 DOS_SHELL

Registered by: VDD VBIOS.SYS as a default VDD.

Use this setting to specify a path and file name for the DOS command processor you want to use in the selected session.

In each DOS session, it is possible to have a unique command processor other than the default COMMAND.COM that is provided by OS/2 Warp 4.

E.6.15 DOS_STARTUP_DRIVE

Registered by: VDD VBIOS.SYS as a default VDD.

Use this setting to specify the location of the DOS operating system that should be booted into this VDM. This is useful if you want to boot a specific version of DOS into a VDM, in order to run an application that requires that version of DOS.

DOS_STARTUP_DRIVE allows you to select drive A:, or a path to a diskette image file created using the **VMDISK** utility. Using this setting allows you to have multiple versions of DOS loaded into different VDMs, from different disks or diskette images.

E.6.16 DOS_VERSION

Registered by: DOSKRNL.

Some DOS applications query DOS to determine the DOS version before starting up. This is usually done by DOS programs that use different paths of execution, depending upon the version of DOS under which they are running. Such execution branches were necessary under certain versions of DOS, due to incompatibilities when migrating from one DOS version to another. An example of an application that changes its execution path in this way is dBASE IV.

Such applications typically make allowance for two or three different versions of DOS. However, OS/2 Warp 4's DOS emulation may return a value different from those that the application can handle. The DOS_VERSION setting allows you to "fake" the DOS version, in order to allow such applications to work under OS/2 Warp 4.

You can use DOS_VERSION to specify the version of DOS that is returned in response to queries from specific DOS programs. Note that changing DOS_VERSION *does not* make OS/2 Warp 4 or the VDM compatible with that version of DOS. DOS_VERSION only informs the program of the version of DOS upon which it is running.

E.6.17 HW_NOSOUND

Registered by: VDD VTIMER.SYS as a default VDD.

Use this setting to prevent this VDM from generating program-defined sounds. You can use HW_NOSOUND to deactivate sound within an application, even if the application does not provide you with this option.

E.6.18 HW_ROM_TO_RAM

Registered by: VDD VBIOS.SYS as a default VDD.

Use this setting to copy ROM BIOS code to RAM.

This setting is useful if your DOS program modifies ROM BIOS code while executing. This can also be helpful if you are debugging a ROM and want to set breakpoints in this area of memory using a debugging tool. Most debuggers typically replace any debug point in RAM with some predefined hardware interrupt call, for example INT3. To debug a ROM with breakpoints, you must copy the ROM to RAM so that you can modify the memory area on the fly.

E.6.19 HW_TIMER

Registered by: VDD VTIMER.SYS as a default VDD.

Use this setting to provide programs running in this VDM with direct access to hardware timer ports. Set HW_TIMER to ON for games and other timing-sensitive applications.

This setting allows a DOS application to implement its own timer services instead of using OS/2 Warp 4's services to control the timer. This often provides better performance for games and graphical applications.

E.6.20 IDLE_SECONDS

Registered by: VDD VKBD.SYS as a default VDD.

Use this setting to select a period of allowable idle time before OS/2 Warp 4 reduces an idle program's portion of processor time.

This DOS setting enables a VDM not to yield its time-slice to the scheduler. This is important if you have a DOS application that is waiting for a slow device to do something that should not be interrupted.

E.6.21 IDLE_SENSITIVITY

Registered by: VDD VKBD.SYS as a default VDD.

Use this setting to set a threshold for polling time before OS/2 Warp 4 reduces the polling program's portion of processor time. Setting this value to 100 will disable the idle detection.

This setting provides a way to make your DOS applications run faster. Note, however, that not all applications benefit from increasing the value of IDLE_SENSITIVITY. Applications that can benefit most from increasing the IDLE_SENSITIVITY value are those which require the most keyboard interaction.

Another problem that you can avoid by increasing IDLE_SENSITIVITY is that where a hung DOS application begins to speed up whenever you press a key on the keyboard. It is likely that the DOS application is hooking the IDLE_SENSITIVITY code interrupt, and the keyboard handler is getting out of synchronization. Pressing any key on the keyboard allows the IDLE_SENSITIVITY code within the keyboard handler to re-synchronize itself, and the application resumes its normal processing speed. Increasing the IDLE_SENSITIVITY value for the VDM will overcome this problem and your application will run smoothly.

E.6.22 INT_DURING_IO

Registered by: VDD VPIC.SYS as a default VDD.

Use this setting to enable interrupts during file reads and writes. When INT_DURING_IO is set to OFF, DOS programs will not receive interrupts until after the

read/write operation is complete. You should set INT_DURING_IO to ON for multimedia applications, which must process interrupts at a greater rate when running full-motion video or high-fidelity sound reproduction.

E.6.23 SESSION_PRIORITY

Registered by: NA

OS/2 Warp 4 provides a built-in prioritization scheme for different sessions. You can specify the default priority for this VDM, from zero to 31 in increments of 1 with a default setting of zero.

Note that SESSION_PRIORITY cannot be reset for a WIN-OS/2 session while that session's VDM is running. To change SESSION_PRIORITY, you must end the WIN-OS/2 session, reset the priority, and restart the WIN-OS/2 session.

E.7 WIN-OS/2 Specific Settings

These settings are specific to WIN-OS/2, and enable you to configure the way in which WIN-OS/2 applications will run in a VDM.

E.7.1 WIN_RUN_MODE

Registered by: NA

Use this setting to specify the execution mode for a WIN-OS/2 application in this VDM. You can use standard mode or 386 enhanced mode, and you can vary this mode for each VDM.

E.7.2 WIN_DDE

Registered by: VWIN

Use this setting to allow WIN-OS/2 applications to share DDE information with other WIN-OS/2 applications running in different sessions, or with OS/2 applications.

If you wish to allow WIN-OS/2 applications to share DDE information, set WIN_DDE to ON. The default is OFF, since this reduces memory requirements and improves the startup speed of WIN-OS/2 sessions.

E.7.3 WIN_CLIPBOARD

Registered by: VWIN

Use this setting to allow WIN-OS/2 to share clipboard information with WIN-OS/2 applications running in other sessions, and with OS/2 applications.

If you wish to allow WIN-OS/2 applications to share clipboard information, set WIN_CLIPBOARD to ON. The default is OFF, since this reduces memory requirements and improves the startup speed of WIN-OS/2 sessions.

E.7.4 WIN_ATM

Registered by: NA

This setting enables Adobe Type Manager (ATM) font support for a WIN-OS/2 session. When WIN_ATM is set to OFF, Adobe Type Manager will not be loaded when you start the WIN-OS/2 session. It is important that you set it to OFF if you do not need the Adobe Type Manager Font Support package. Once ATM is started for a WIN-OS/2 session, it will take up space in memory even if you are not using ATM, and the startup time for your WIN-OS/2 session will be increased.

If you change WIN_ATM to ON while a WIN-OS/2 session is running, ATM is not automatically started. You must close and restart the WIN-OS/2 session to make the changes effective.

E.8 WIN-OS/2 System Files

Below are the main system files that are used in a WIN-OS/2 session. They are almost identical to a standard installation of Microsoft Windows on a DOS machine.

E.8.1 SYSTEM.INI

The SYSTEM.INI has all the main sections. This is required to maintain compatibility for applications that are installed within the WIN-OS/2 environment.

```
[boot]
useos2shield=1
os2shield=winsheld.exe
shell=progman.exe
mouse.drv=mouse.drv
network.drv=
language.dll=langeng.dll
comm.drv=comm.drv
keyboard.drv=keyboard.drv
system.drv=atmsys.drv
;386grabber=vga.3gr              /* The screen drivers handles are
;286grabber=vgacolor.2gr         /* replaced by OS/2 screen handlers
drivers=mmsystem.dll
WAVDMAPPS=
atm.system.drv=system.drv
display.drv=s3.drv
sdisplay.drv=swins3.drv
fonts.fon=vgasys.fon
fixedfon.fon=vgafix.fon
oemfonts.fon=vgaoem.fon
```

```
os2gdi.exe=GDI.EXE              /* Note a different GDI.EXE
os2user.exe=user.exe            /* and also a different USER.EXE

[keyboard]
subtype=
type=4
keyboard.dll=kbdus.dll
oemansi.bin=xlat850.bin

[boot.description]
keyboard.typ=Enhanced 101 or 102 key US and Non US keyboards
mouse.drv=Microsoft, or IBM PS/2
network.drv=No Network Installed
language.dll=English (American)
system.drv=MS-DOS System
codepage=850
woafont.fon=Multi-Lingual (850)
aspect=100,96,96
display.drv=640x480
sdisplay.drv=640x480

[386Enh]                        /* The [386Enh] sections remain
mouse=*vmd                      /* identical for application
network=*dosnet,*vnetbios       /* compatibility
ebios=*ebios
woafont=dosapp.fon
display=*vddvga
EGA80WOA.FON=EGA80WOA.FON
EGA40WOA.FON=EGA40WOA.FON
CGA80WOA.FON=CGA80WOA.FON
CGA40WOA.FON=CGA40WOA.FON
keyboard=*vkd
device=vtdapi.386
device=*vpicd
device=*vtd
device=*reboot
device=*vdmad
device=*vsd
device=*v86mmgr
device=*pageswap
device=*dosmgr
device=*vmpoll
device=*wshell
device=*BLOCKDEV
device=*PAGEFILE
device=*vfd
device=*parity
device=*biosxlat
device=*vcd
device=*vmcpd
```

```
device=*combuff
device=*cdpscsi
local=CON
FileSysChange=off
PagingFile=D:\WIN386.SWP
MaxPagingFileSize=20480

[standard]

[NonWindowsApp]
localtsrs=dosedit,ced

[mci]
WaveAudio=mciwave.drv
Sequencer=mciseq.drv
CDAudio=mcicda.drv

[drivers]
timer=timer.drv
midimapper=midimap.drv

[timer.drv]
TIMERMax386Res=10
TIMERMax286Res=10
```

E.8.2 WIN.INI

Like the SYSTEM.INI, the WIN.INI file maintains the same functionality as a standard DOS/Windows machine.

```
[windows]
load=
run=
Beep=yes
Spooler=no
NullPort=None
device=IBM 4039 LaserPrinter PS,pscript,LPT1.OS2
BorderWidth=3
CursorBlinkRate=530
DoubleClickSpeed=452
Programs=com exe bat pif
Documents=
DeviceNotSelectedTimeout=15
TransmissionRetryTimeout=45
KeyboardDelay=2
KeyboardSpeed=31
ScreenSaveActive=0
ScreenSaveTimeOut=120
```

```
[Desktop]
Pattern=(None)
Wallpaper=(None)
GridGranularity=0
IconSpacing=100

[Extensions]
trm=terminal.exe *.trm
rec=recorder.exe *.rec
hlp=winhelp.exe *.hlp
wri=write.exe *.wri
pcx=pbrush.exe *.pcx
bmp=pbrush.exe *.bmp
cal=calendar.exe *.cal
crd=cardfile.exe *.crd
txt=notepad.exe *.txt
ini=notepad.exe *.ini
sam=c:\lotsuite\wordpro\wordpro.exe *.sam
lwp=c:\lotsuite\wordpro\wordpro.exe *.lwp
mwp=c:\lotsuite\wordpro\wordpro.exe *.mwp
pre=c:\lotsuite\flw\flw.exe *.pre
prs=c:\lotsuite\flw\flw.exe *.prs
sym=c:\lotsuite\flw\flw.exe *.sym
mas=c:\lotsuite\flw\flw.exe *.mas

[intl]
sLanguage=enu
sCountry=United States
iCountry=1
iDate=0
iTime=0
iTLZero=0
iCurrency=0
iCurrDigits=2
iNegCurr=0
iLzero=1
iDigits=2
iMeasure=1
s1159=AM
s2359=PM
sCurrency=$
sThousand=,
sDecimal=.
sDate=/
sTime=:
sList=,
sShortDate=M/d/yy
sLongDate=dddd, MMMM dd, yyyy
```

```
[ports]
; A line with \filename\.PRN followed by an equal sign causes
; \filename\ to appear in the Control Panel's Printer Configuration dialog
; box. A printer connected to \filename\ directs its output into this file.
LPT1:=
LPT2:=
LPT3:=
COM1:=9600,n,8,1,x
COM2:=9600,n,8,1,x
COM3:=9600,n,8,1,x
COM4:=9600,n,8,1,x
EPT:=
FILE:=
LPT1.OS2=
LPT2.OS2=                       /* Notice the added OS2 defined
LPT3.OS2=                       /* printer ports.  LPT4.OS2 can be added
                                /* if required.
[FontSubstitutes]
Helv=MS Sans Serif
Tms Rmn=MS Serif
Times=Times New Roman
Helvetica=Arial

[TrueType]

[Sounds]
SystemDefault=ding.wav, Default Beep
SystemExclamation=chord.wav, Exclamation
SystemStart=tada.wav, Windows Start
SystemExit=chimes.wav, Windows Exit
SystemHand=chord.wav, Critical Stop
SystemQuestion=chord.wav, Question
SystemAsterisk=chord.wav, Asterisk

[mci extensions]
wav=waveaudio
mid=sequencer
rmi=sequencer

[Compatibility]
NOTSHELL=0x0001
WPWINFIL=0x0006
CCMAIL=0x0008
AMIPRO=0x0010
REM=0x8022
PIXIE=0x0040
CP=0x0040
JW=0x42080
TME=0x0100
VB=0x0200
```

```
WIN2WRS=0x1210
PACKRAT=0x0800
VISION=0x0040
MCOURIER=0x0800
_BNOTES=0x24000
MILESV3=0x1000
PM4=0x2000
DESIGNER=0x2000
PLANNER=0x2000
DRAW=0x2000
WINSIM=0x2000
CHARISMA=0x2000
PR2=0x2000
PLUS=0x1000
ED=0x00010000
APORIA=0x0100
EXCEL=0x1000
GUIDE=0x1000
NETSET2=0x0100
W4GL=0x4000
W4GLR=0x4000
TURBOTAX=0x00080000

[Microsoft Word 2.0]
HPDSKJET=+1

[fonts]
Arial (TrueType)=ARIAL.FOT
Times New Roman (TrueType)=TIMES.FOT
Arial Bold (TrueType)=ARIALBD.FOT
Arial Bold Italic (TrueType)=ARIALBI.FOT
Arial Italic (TrueType)=ARIALI.FOT
Times New Roman Bold (TrueType)=TIMESBD.FOT
Times New Roman Bold Italic (TrueType)=TIMESBI.FOT
Times New Roman Italic (TrueType)=TIMESI.FOT
WingDings (TrueType)=WINGDING.FOT
Roman (Plotter)=ROMAN.FON
Script (Plotter)=SCRIPT.FON
Modern (Plotter)=MODERN.FON
MS Sans Serif 8,10,12,14,18,24 (XGA res)=sseriff.fon
Courier 10,12,15 (XGA res)=courf.fon
MS Serif 8,10,12,14,18,24 (XGA res)=seriff.fon
Symbol 8,10,12,14,18,24 (XGA res)=symbolf.fon
Small Fonts (XGA res)=smallf.fon
LotusWP Int A (TrueType)=TT0011A_.FOT
LotusWP Int B (TrueType)=TT0011B_.FOT
LotusWP Box (TrueType)=TT0011C_.FOT
LotusWP Type (TrueType)=TT0011D_.FOT
LotusWP Icon (TrueType)=TT0011E_.FOT
Math A (TrueType)=MATHA___.FOT
```

```
Math B (TrueType)=MATHB___.FOT
Math C (TrueType)=MATHC___.FOT
Lotus Postal Barcode (TrueType)=WPPOST1.FOT
Arial Narrow Bold Italic (TrueType)=ANBI____.FOT
Arial Narrow Bold (TrueType)=ANB_____.FOT
Arial Narrow Italic (TrueType)=ANI_____.FOT
Arial Narrow (TrueType)=AN______.FOT
Arial Black (TrueType)=ARBL____.FOT
Baskerville Bold Italic (TrueType)=BASBI___.FOT
Baskerville Bold (TrueType)=BASB____.FOT
Baskerville Italic (TrueType)=BASI____.FOT
Baskerville (TrueType)=BAS_____.FOT
Binner Gothic (TrueType)=BG______.FOT
Centaur Italic (TrueType)=CTRI____.FOT
Centaur (TrueType)=CTR_____.FOT
Garamond Bold Italic (TrueType)=GARBI___.FOT
Garamond Bold (TrueType)=GARB____.FOT
Garamond Italic (TrueType)=GARIT___.FOT
Garamond (TrueType)=GAR_____.FOT
Gill Sans Bold Italic (TrueType)=GNBI____.FOT
Gill Sans Bold (TrueType)=GNB_____.FOT
Gill Sans Condensed Bold (TrueType)=GILCB___.FOT
Gill Sans Condensed (TrueType)=GILC____.FOT
Gill Sans Italic (TrueType)=GNI_____.FOT
Gill Sans Ultra Bold (TrueType)=GILU____.FOT
Gill Sans (TrueType)=GIL_____.FOT
Impact (TrueType)=IMPACT__.FOT
Letter Gothic (TrueType)=LC______.FOT
Monotype Sorts (TrueType)=MTSORTS_.FOT
News Gothic Bold (TrueType)=NGOB____.FOT
News Gothic Italic (TrueType)=NGOI____.FOT
News Gothic (TrueType)=NEGR____.FOT
Nimrod Bold Italic (TrueType)=NIMBI___.FOT
Nimrod Bold (TrueType)=NIMB____.FOT
Nimrod Italic (TrueType)=NIMI____.FOT
Nimrod (TrueType)=NIM_____.FOT
Onyx (TrueType)=ONY_____.FOT
Botanical (TrueType)=PIB_____.FOT
Rockwell Bold Italic (TrueType)=ROCBI___.FOT
Rockwell Bold (TrueType)=ROCB____.FOT
Rockwell Condensed Bold (TrueType)=ROCCB___.FOT
Rockwell Light Italic (TrueType)=ROCLI___.FOT
Rockwell Light (TrueType)=ROCL____.FOT
Brush Script (TrueType)=BRS_____.FOT
Perpetua (TrueType)=PER_____.FOT
Perpetua Bold (TrueType)=PERB____.FOT
Photina Casual Black (TrueType)=PHOTCABL.FOT

[embedding]
Package=Package,Package,packager.exe,picture
```

```
SoundRec=Sound,Sound,SoundRec.exe,picture
PBrush=Paintbrush Picture,Paintbrush Picture,pbrush.exe,picture
WordPro.Document=Lotus Word Pro Document,Lotus Word Pro Document,
     c:\lotsuite\wordpro\wordpro.exe,picture
AmiProDocument=AmiPro Document,AmiPro Document,
     c:\lotsuite\wordpro\wordpro.exe,picture
FLWPresentation=Freelance Presentation,Freelance Presentation,
     c:\lotsuite\flw\FLWMAIN.EXE,picture
LotusSound=Lotus Sound,Lotus Sound,
     c:\os2\mdos\winos2\lotusapp\MULTIMED\LOTUSSND.EXE,picture
LotusMedia=Lotus Media,Lotus Media,
     c:\os2\mdos\winos2\lotusapp\MULTIMED\MEDMAN.EXE,picture
LotusAnNote=Lotus Annotator Note,Lotus Annotator Note,
     c:\os2\mdos\winos2\lotusapp\MULTIMED\ANNOTATE.EXE,pictu

[PrinterPorts]
IBM 4039 LaserPrinter PS=pscript,LPT1.OS2,15,45

[devices]
IBM 4039 LaserPrinter PS=pscript,LPT1.OS2

[colors]
Background=192 192 192
AppWorkspace=255 255 232
Window=255 255 255
WindowText=0 0 0
Menu=255 255 255
MenuText=0 0 0
ActiveTitle=64 128 128
InactiveTitle=192 192 192
TitleText=255 255 255
ActiveBorder=255 255 128
InactiveBorder=192 192 192
WindowFrame=0 0 0
Scrollbar=192 192 192
ButtonFace=192 192 192
ButtonShadow=128 128 128
ButtonText=0 0 0
GrayText=128 128 128
Hilight=128 128 128
HilightText=255 255 255
InactiveTitleText=128 128 128
ButtonHilight=255 255 255

[Freemem]
Position=1,1

[Windows Help]
H_WindowPosition=[213,160,213,160,0]
```

```
[spooler]
window=0 0 636 408

[PSCRIPT]
External Printers=7
Printer1=40291760
Printer2=40291730
Printer3=40293930
Printer4=40293960
Printer5=IBM17521
Printer6=IBM39521
```

Appendix F. The OS/2 Warp 4 CONFIG.SYS

This appendix provides a sample CONFIG.SYS, with an explanation of the various statements:

F.1 Sample OS/2 Warp 4 CONFIG.SYS

The CONFIG.SYS will differ according to what software programs (for example, networking applications or BonusPak) are installed. It will also be dependent on your machine's configuration.

```
IFS=C:\OS2\HPFS.IFS /CACHE:2048 /CRECL:4 /AUTOCHECK:C
PROTSHELL=C:\OS2\PMSHELL.EXE
SET USER_INI=C:\OS2\OS2.INI
SET SYSTEM_INI=C:\OS2\OS2SYS.INI
SET OS2_SHELL=C:\OS2\CMD.EXE
SET AUTOSTART=PROGRAMS,TASKLIST,FOLDERS,WARPCENTER
SET RUNWORKPLACE=C:\OS2\PMSHELL.EXE
SET COMSPEC=C:\OS2\CMD.EXE
LIBPATH=C:\IBMLAN\NETLIB;C:\MUGLIB\DLL;C:\SVCA\DLL\AGENT;C:\OS2\DLL;
C:\MPTN\DLL;C:\IBMCOM\DLL;C:\IBMI18N\DLL;C:\OS2\MDOS;C:\;C:\OS2\APPS\DLL;
.;\OS2\INSTALL;Z:\CID\LOCINSTU;\OS2\DLL;\OS2\MDOS;C:\BONUSPAK\IBMWORKS;
C:\BONUSPAK\RS231B;C:\JAVAOS2\DLL;C:\MMOS2\DLL;C:\IBMINST;C:\NETWARE;
C:\NETWARE\NLS\ENGLISH;L:\OS2;P:\OS2;C:\MFS\DLL;C:\NSC\DLL;C:\TCPIP\DLL;
C:\TCPIP\PCOMOS2;C:\TCPIP\UMAIL;C:\WAL\DLL;C:\NETFIN;
SET PATH=C:\MPTN\BIN;C:\ibmcom;C:\IBMLAN\NETPROG;C:\MUGLIB;
C:\SVCA\BIN\AGENT;C:\OS2;C:\OS2\SYSTEM;C:\OS2\MDOS\WINOS2;C:\OS2\INSTALL;
C:\;C:\OS2\MDOS;C:\OS2\APPS;\;\OS2;\OS2\SYSTEM;\OS2\INSTALL;C:;
C:\BONUSPAK\IBMWORKS;C:\JAVAOS2\BIN;C:\MMOS2;C:\NETWARE;L:\OS2;P:\OS2;
C:\MFS\BIN;C:\NSC;c:\tcpip\bin;c:\tcpip\pcomos2;C:\TCPIP\UMAIL;
C:\WAL;C:\NETFIN;
SET DPATH=C:\MPTN;C:\IBMCOM;C:\IBMLAN\NETPROG;C:\IBMLAN;C:\MUGLIB;
C:\SVCA\HELP;C:\SVCA\ETC;C:\OS2;C:\OS2\SYSTEM;C:\OS2\MDOS\WINOS2;
C:\OS2\INSTALL;C:\;C:\OS2\BITMAP;C:\OS2\MDOS;C:\OS2\APPS;\;\OS2;
\OS2\SYSTEM;\OS2\INSTALL;C:;Z:\CID\LOCINSTU;C:\MMOS2;C:\MMOS2\INSTALL;
C:\IBMINST;C:\NETWARE;C:\NETWARE\NLS;C:\NETWARE\NLS\ENGLISH;
L:\NLS;P:\NLS;C:\NSC;C:\TCPIP\PCOMOS2;C:\WAL;C:\NETFIN;
SET ADAPTER_NIF=IBMTOK.NIF
SET SRVNAME1=6JGURF8H
SET PROMPT=$I$P
SET HELP=C:\MPTN;C:\OS2\HELP;C:\BONUSPAK\ASKPSP\BOOKS;
C:\BONUSPAK\IBMWORKS;C:\MMOS2\HELP;C:\SVCA\HELP;C:\MFS\DOC;
c:\tcpip\help;C:\TCPIP\UMAIL;C:\WAL;
SET GLOSSARY=C:\OS2\HELP\GLOSS;
SET IPF_KEYS=SBCS
PRIORITY_DISK_IO=YES
FILES=20
BASEDEV=IBMKBD.SYS
```

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```
DEVICE=C:\IBMCOM\PROTOCOL\LANPDD.OS2
DEVICE=C:\IBMCOM\PROTOCOL\LANVDD.OS2
DEVICE=C:\ibmcom\LANMSGDD.OS2 /I:C:\ibmcom /S
DEVICE=C:\ibmcom\PROTMAN.OS2 /I:C:\ibmcom
DEVICE=C:\OS2\BOOT\TESTCFG.SYS
DEVICE=C:\OS2\BOOT\DOS.SYS
DEVICE=C:\OS2\BOOT\PMDD.SYS
BUFFERS=90
IOPL=YES
DISKCACHE=D,LW
MAXWAIT=3
MEMMAN=SWAP,PROTECT
SWAPPATH=C:\OS2\SYSTEM 2048 2048
BREAK=OFF
THREADS=1024
PRINTMONBUFSIZE=134,134,134
COUNTRY=001,C:\OS2\SYSTEM\COUNTRY.SYS
SET KEYS=ON
SET BOOKSHELF=C:\IBMLAN\BOOK;C:\OS2\BOOK;C:\BONUSPAK\ASKPSP\BOOKS;
C:\MMOS2;c:\tcpip\help;
SET SOMIR=C:\OS2\ETC\SOM.IR;C:\OS2\ETC\WPSH.IR;C:\OS2\ETC\WPDSERV.IR;
C:\OS2\ETC\REXX.IR
SET SOMDDIR=C:\OS2\ETC\DSOM
SET ULSPATH=C:\LANGUAGE
SET LOCPATH=C:\IBMI18N\LOCALE;C:\LANGUAGE\LOCALE
BASEDEV=TIMER0.SYS
REM SET DELDIR=C:\DELETE,512;
BASEDEV=PRINT01.SYS
BASEDEV=IBM1FLPY.ADD
BASEDEV=IBM2FLPY.ADD
BASEDEV=IBM1S506.ADD
BASEDEV=XDFLOPPY.FLT
BASEDEV=OS2DASD.DMD
RUN=C:\OS2\SYSTEM\HYBERSET.EXE
SET EPMPATH=C:\OS2\APPS;
PROTECTONLY=NO
SHELL=C:\OS2\MDOS\COMMAND.COM C:\OS2\MDOS
FCBS=16,8
RMSIZE=640
DEVICE=C:\NETWARE\VIPX.SYS
DEVICE=C:\NETWARE\VSHELL.SYS GLOBAL
DEVICE=C:\OS2\MDOS\VEMM.SYS
DOS=LOW,NOUMB
DEVICE=C:\OS2\MDOS\VXMS.SYS /UMB
DEVICE=C:\OS2\MDOS\VDPMI.SYS
DEVICE=C:\OS2\MDOS\VDPX.SYS
DEVICE=C:\OS2\MDOS\VWIN.SYS
DEVICE=C:\OS2\MDOS\VW32S.SYS
DEVICE=C:\OS2\MDOS\VMOUSE.SYS
DEVICE=C:\OS2\BOOT\POINTDD.SYS
```

```
DEVICE=C:\OS2\BOOT\MOUSE.SYS
DEVICE=C:\OS2\BOOT\COM.SYS
DEVICE=C:\OS2\MDOS\VCOM.SYS
SET LANG=EN_US
SET TZ=EST5EDT
CODEPAGE=437,850
DEVINFO=KBD,US,C:\OS2\KEYBOARD.DCP
DEVINFO=SCR,VGA,C:\OS2\BOOT\VIOTBL.DCP
SET VIDEO_DEVICES=VIO_SVGA
SET VIO_SVGA=DEVICE(BVHVGA,BVHSVGA)
DEVICE=C:\OS2\MDOS\VSVGA.SYS
SET DMIPATH=C:\DMISL\BIN
RUN=C:\OS2\SMSTART.EXE
SET IBMWORKS_INI=C:\BONUSPAK\IBMWORKS
DEVICE=C:\BONUSPAK\RS231B\ECRDRV.SYS
DEVICE=C:\BONUSPAK\RS231B\RSMVDWO.SYS
CALL=C:\BONUSPAK\RS231B\PPS731B.EXE
SET CLASSPATH=C:\JAVAOS2\LIB\JEMPCL10.ZIP;.\.
SET INCLUDE=C:\JAVAOS2\INCLUDE;C:\JAVAOS2\INCLUDE\OS2;C:\DMISL\INCLUDE;
SET LIB=C:\JAVAOS2\LIB;C:\DMISL\LIB;
SET MMBASE=C:\MMOS2;
SET DSPPATH=C:\MMOS2\DSP;
SET NCDEBUG=4000
RUN=C:\MMOS2\MIDIDMON.EXE
DEVICE=C:\MMOS2\SSMDD.SYS
DEVICE=C:\MMOS2\R0STUB.SYS
DEVICE=C:\MMOS2\MIDI.SYS
DEVICE=C:\MMOS2\VCSHDD.SYS
REM --- NetWare Requester statements BEGIN ---
SET NWLANGUAGE=ENGLISH
DEVICE=C:\NETWARE\LSL.SYS
RUN=C:\NETWARE\DDAEMON.EXE
DEVICE=C:\IBMCOM\PROTOCOL\ODI2NDI.OS2
REM -- ODI-Driver Files BEGIN --
rem DEVICE=C:\NETWARE\NTR2000.SYS
REM -- ODI-Driver Files END --
DEVICE=C:\NETWARE\ROUTE.SYS
DEVICE=C:\NETWARE\IPX.SYS
DEVICE=C:\NETWARE\SPX.SYS
RUN=C:\NETWARE\SPDAEMON.EXE
rem DEVICE=C:\NETWARE\NMPIPE.SYS
rem DEVICE=C:\NETWARE\NPSERVER.SYS
rem RUN=C:\NETWARE\NPDAEMON.EXE
DEVICE=C:\NETWARE\NWREQ.SYS
IFS=C:\NETWARE\NWIFS.IFS
RUN=C:\NETWARE\NWDAEMON.EXE
rem DEVICE=C:\NETWARE\NETBIOS.SYS
rem RUN=C:\NETWARE\NBDAEMON.EXE
DEVICE=C:\OS2\MDOS\LPTDD.SYS
REM --- NetWare Requester statements END ---
```

```
CALL=C:\ibmcom\PROTOCOL\NETBIND.EXE
RUN=C:\ibmcom\LANMSGEX.EXE
SET NLSPATH=C:\MPTN\MSG\NLS\%N;c:\tcpip\msg\enus850\%N;
SET ETC=C:\MPTN\ETC
DEVICE=C:\MPTN\PROTOCOL\SOCKETS.SYS
DEVICE=C:\MPTN\PROTOCOL\AFOS2.SYS
DEVICE=C:\MPTN\PROTOCOL\AFINET.SYS
DEVICE=C:\MPTN\PROTOCOL\IFNDIS.SYS
RUN=C:\MPTN\BIN\CNTRL.EXE
CALL=C:\OS2\CMD.EXE /Q /C C:\MPTN\BIN\MPTSTART.CMD >NUL
DEVICE=C:\IBMCOM\PROTOCOL\NETBEUI.OS2
DEVICE=C:\IBMLAN\NETPROG\RDRHELP.200
IFS=C:\IBMLAN\NETPROG\NETWKSTA.200 /I:C:\IBMLAN /N
DEVICE=C:\IBMCOM\PROTOCOL\NETBIOS.OS2
SET I18NDIR=C:\IBMI18N
SET NETVIEW_PATH=C:\SVCA
SET SVA_PATH=C:\SVCA
SET SNMPDIR=C:\SVCA\ETC
IFS=C:\MFS\DLL\MCM.IFS
SET MFSCACHE=C:\MFS\CACHE\
SET HOARDPATH=C:\MFS\BIN\HP
FILES=90
RUN=C:\IBMLAN\NETPROG\LSDAEMON.EXE
DEVICE=C:\IBMLAN\NETPROG\VNETAPI.OS2
RUN=C:\IBMLAN\NETPROG\VNRMINIT.EXE
SET NWDBPATH=C:\IBMLAN\NETPROG
SET DLSINI=C:\IBMLAN\NETPROG\NETGUI.INI
SET INIT_FILE_NAMES=netgui
SET INIT_FILE_RANGES=200
SET WPS_COMMUNICATION=YES
SET LANINSTEP=Z:\CID\IMG\ibmpeer
SET TMP=c:\tcpip\tmp
DEVICE=c:\tcpip\bin\vdostcp.vdd
DEVICE=c:\tcpip\bin\vdostcp.sys
RUN=c:\tcpip\bin\VDOSCTL.EXE
DEVICE=C:\OS2\LOG.SYS
RUN=C:\OS2\EPW.EXE
RUN=C:\OS2\SYSTEM\LOGDAEM.EXE
DEVICE=C:\IBMCOM\MACS\IBMTOK.OS2

DEVICE=C:\NETFIN\SYSINFO.SYS
REM BASEDEV=NFDASD.FLT
```

F.2 BASEDEV Statements

BASEDEV statements install a base device driver. A device driver contains code that OS/2 Warp 4 needs in order to recognize a device and correctly process information received from or sent to that device. A base device driver is one that is needed when

OS/2 is first started. Device support for disks, diskettes, printers connected to the workstation, and other devices can be loaded with the BASEDEV statement.

Unlike the DEVICE statement, the BASEDEV statement cannot contain either drive or path information because OS/2 cannot process such information at the stage of the startup sequence when the BASEDEV statements are processed. The root directory of the startup partition is first searched for the specified file name, then the \OS2\BOOT directory of the startup partition is searched. If drive or path information is included in a BASEDEV statement, an error is generated.

In addition, BASEDEV statements are not necessarily processed in the order in which they appear in your CONFIG.SYS file. The extensions of the file names specified in the BASEDEV statements are examined; the statements are then processed in the following order of file name extensions:

```
.SYS
.BID
.VSD
.TSD
.ADD
.I13
.FLT
.DMD
```

Files with other file-name extensions will not be loaded. If several BASEDEV statements load file names with the same extension, those files will be loaded in the order in which they appear in the CONFIG.SYS file.

For more information on BASEDEV statements, type `help basedev` in an OS/2 window.

F.3 DEVICE Statements

DEVICE statements install a device driver by specifying the path and complete file name of the device driver in your CONFIG.SYS file. A device driver loads standard default drivers that support standard system display terminals, keyboards, printers, diskette drives, hard disk drives, and serial devices. You can, however, replace these or add other devices by coding and loading a device driver using DEVICE statements in the CONFIG.SYS file. DEVICE statements are processed in the order in which they appear in the CONFIG.SYS file.

Any time you add or make changes to the CONFIG.SYS file, you must restart the system in order for the new device or change to become effective. Remember, the CONFIG.SYS file is read only during system startup. Anything added to this file after system initialization does not work until you restart the system.

F.4 RUN Statements

RUN statements load and start a system program during system initialization. A RUN statement does not start a Presentation Manager application.

It is important to note that more than one RUN statement might appear in the CONFIG.SYS file. The RUN statements are processed in the order in which they appear in the file, but all DEVICE statements are processed before any RUN statements.

If a program started with a RUN statement requests a window before the user interface is started, it receives a unique error code. The program might respond by delaying its processing until the user interface is started.

A program started with a RUN statement can establish a keyboard or mouse monitor for any non-detached program. Also, it can issue I/O requests to the keyboard, mouse, or display only after it has established a window.

Because RUN programs are started before initialization of the user interface and disk error handling, the program must prevent the OS/2 operating system from performing disk handling in order to perform its own.

F.5 CALL Statements

A CALL statement calls a batch file from within another batch file without ending the first one. A batch file can then be used as commands from within a master batch file. It is important to note that:

- Piping and redirection should not be used with the CALL command.
- You can use CALL from any line inside a batch file.
- The number of batch files is limited only by available memory. In an OS/2 session, a batch file should not call itself. If it does, it runs out of stack space and ends. In a DOS session, a batch file can call itself, but make sure that the batch file eventually ends.
- CALL causes the data structure and file pointer of the currently running batch file to be saved, and a new data structure to be created. When the called batch file ends, the original batch file continues its processing with the statement following CALL.
- You can use CALL to protect your INI files by having them automatically backed up each time you start your system. For example, if you include the following statements in your CONFIG.SYS file, a backup copy of your current INI files and a backup copy of the INI files as they existed at the previous system startup will be made. Note, however, that when you archive your desktop, the INI files will be saved anyway (see the Archive tab on your desktop's Properties menu).

```
CALL=C:\OS2\XCOPY.EXE C:\OS2\*.INX C:\OS2\*.INY
CALL=C:\OS2\XCOPY.EXE C:\OS2\OS2*.INI C:\OS2\*.INX
```

- By copying the INI files this way, you will always be able to recover a recent version of these files in case the user INI file becomes damaged.
- Batch-file parameters can be passed to another batch file with CALL.

F.6 SET Statements

The SET command establishes changes, or remote environment variables of your current OS/2 session.

It sets one string in the environment equal to another string for later use in programs (for example, SET STRING1=STRING2). You can use the SET command in your CONFIG.SYS file or batch files to set search paths and environment variables.

Enter this command without a parameter to display the environment variables for the current mode of operation (that is, enter SET at a command prompt).

If the name specified by the first string of the SET command already exists in the environment, the command processor replaces its current value with the new value specified by the second string. If you enter the SET command with only the first string and the equals sign (=), the command processor removes the environment variable or replaceable parameter name and its associated value from the environment, if the name exists.

F.7 Explanation of the CONFIG.SYS

The following is a detailed description of the CONFIG.SYS file in OS/2 Warp 4.

F.7.1 IFS=C:\OS2\HPFS.IFS /CACHE:2048 /CRECL:4 /AUTOCHECK:C

IFS stands for installable file system. An installable file system driver is a file that contains code needed to manage disks and diskettes formatted for file systems other than the file allocation table (FAT). This OS/2 command installs the high performance file system (HPFS). The syntax for this line is IFS=DRIVE:PATH\FILENAME,SWITCHES. There are three switches:

1. /CACHE:Nnn sets up a disk cache and its size.
2. /CRECL sets the maximum record size for caching, from 2 KB to 64 KB in multiples of 2 KB with a default of 4 KB. This parameter may not exceed 1/4 of the total cache size set with the /cache parameter.
3. /AUTOCHECK:Nn tells the system to check each drive listed to see if it was shut down properly. If not, it will run CHKDSK on only the drives indicated.

F.7.2 PROTSHELL=C:\OS2\PMSHELL.EXE

This statement loads the user interface program. PMSHELL.EXE is the program that starts the OS/2 Presentation Manager, a graphical user interface (GUI). If you replace it with CMD.EXE, an OS/2 command line interface will come up. You will not be able to run any PM programs, however. If you remove the PROTSHELL statement, the PMSHELL interface will come up by default.

There are other interface programs available (for example, TSHELL.EXE)

F.7.3 SET USER_INI=C:\OS2\OS2.INI

This statement gives the name and location of the file that contains your desktop setup information and the options saved from various OS/2 applications. OS2.INI is the default file name.

F.7.4 SET SYSTEM_INI=C:\OS2\OS2SYS.INI

This statement gives the name and location of the file that contains information about the equipment (for example printers) your system uses. OS2SYS.INI is the default file name.

The INI files

The OS2.INI and OS2SYS.INI are not ASCII files and should not be edited except with an INI editor. Even if you get an INI editor, we recommend you not change the INI files unless you know what you are doing.

F.7.5 SET OS2_SHELL=C:\OS2\CMD.EXE

This statement loads the command line shell CMD.EXE. Do not remove this line or OS/2 will not start. There are other command line shells available (for example, 4OS2).

F.7.6 SET AUTOSTART=PROGRAMS,TASKLIST,FOLDERS,WARPCENTER

This statement contains a list of the components of the Workplace Shell that will be started (or restarted) when the system starts. There are six possible options:

- PROGRAMS - allows application programs that were running when the system was shut down to restart, providing the SET RESTARTOBJECTS=NO statement is not used.
- TASKLIST - Enables the OS/2 Window list.
- FOLDERS - Opens the desktop folder.
- CONNECTIONS - Will try and restart any network connections that were being used when the system was shutdown.
- WARPCENTER - Starts the WarpCenter, which is new to OS/2 Warp 4.

- LAUNCHPAD - This is not part of the default but can be added. This will start the Launchpad, which OS/2 Warp Version 3 users will be familiar with.

F.7.7 SET RUNWORKPLACE=C:\OS2\PMSHELL.EXE

This statement indicates what program to load as the Workplace Shell and where it is located.

F.7.8 SET COMSPEC=C:\OS2\CMD.EXE

This statement indicates what command line shell to load and where it is located.

F.7.9 LIBPATH=

This statement lists the paths the system uses to locate DLL files.

F.7.10 SET PATH=

This statement lists the directories where the system looks to locate programs and commands (for example *.EXE,*.COM,*.BAT,*.CMD files). This is the same as the PATH command in DOS.

F.7.11 SET DPATH=

This statement tells OS/2 programs where to look for data files. It is similar to the DOS APPEND command, but unlike APPEND, DPATH only works with programs designed to use it.

F.7.12 SET ADAPTER_NIF=IBMTOKC.NIF

This statement is part of LAN Adapter and Protocol Support (LAPS) and points out the network information file (NIF) for a LAN card driver.

F.7.13 SET SRVNAME1=6JGURF8H

SRVNAME1 is used for remote installations of OS/2 Warp 4.0. It starts out on disk_1 of the remote boot disks in CONFIG.SYS and is moved to the CONFIG.SYS of the installing base. The value this is set to, is used to configure the link back to the code server. The server name back at the code server is a random name.

F.7.14 SET PROMPT=$i[$p]

This statement sets how your OS/2 command prompt will appear (like the equivalent DOS command). This is for OS/2 only - the PROMPT command in the AUTOEXEC.BAT will change the DOS command lines. In the setting shown here, the command prompt will show the current directory of the default drive enclosed in [] followed by the greater than symbol, for example, [C:\]>. Having brackets [] around the drive and directory information lets you know quickly when you are at an OS/2 command line verses a DOS command line.

If you type PROMPT without a parameter, OS/2 will return its default prompt.

Options include:

$B	The | character
$C	The open parenthesis (
$D	Current date
$E	ASCII code 27 (escape) so you can work with ANSI.
$F	The close parenthesis)
$G	The greater than > symbol
$H	BACKSPACE over the previous character
$I	Turns help line on
$L	The less than < character
$N	Default drive
$P	Current directory of default drive
$Q	The equal character
$S	The space character
$T	Current time
$V	OS/2 version number
$_	Carriage return or line feed

F.7.15 SET HELP=

This statement points to where the help files are located.

F.7.16 SET GLOSSARY=C:\OS2\HELP\GLOSS

This statement points to where Glossary and Master Help files are located.

F.7.17 SET IPF_KEYS=SBCS

The character set for most languages can be represented as data using an 8-bit byte since their characters sets are each less than 256 characters. These are called single byte character sets (SBCS). Languages such as Japanese (Kanji), Korean and Chinese (both Traditional and Simplified) can only be represented using two 8-bit bytes or 16 bits. These are double byte character sets (DBCS).

This command tells the Information Presentation Facility (INF and help files) which type of character set is being used, that is, single or double byte character set. This is an environment variable.

F.7.18 PRIORITY_DISK_IO=YES

This statement specifies disk input/output priority for applications running in the foreground. When PRIORITY_DISK_IO=YES is specified in the CONFIG.SYS file, an application running in the foreground will receive disk I/O priority over applications running in the background. This means that the application in the foreground will have a better response time than applications running in the background.

To specify that all applications (foreground and background) are to be treated equally with regard to disk access, type the following in the CONFIG.SYS file:

```
PRIORITY_DISK_IO=NO
```

F.7.19 FILES=20

This statement determines the maximum number of files available in DOS sessions. This statement has no effect in OS/2 sessions.

The syntax for the line is: `FILES=N`, where `N` specifies a number from 20 to 255 that indicates the maximum number of files that can be open at the same time. This means that a DOS session can access the number of files that you specify in the CONFIG.SYS file. The default value is 20. To specify a maximum of 40 files to be open at the same time in a DOS session, type the following in the CONFIG.SYS file:

```
FILES=40
```

When a DOS session is started, 20 files are available to be used by all programs running in that DOS session. A file is in use when a program is processing some kind of operation in it. When a program is using a file for its operation, that file is unavailable to another program. The file is returned to availability when the program has finished its operation and the file is closed.

Regardless of the FILES= setting, all DOS programs are initialized to a maximum of 20 files. It is the responsibility of an application to increase the number of files up to the maximum set by the FILES= statement.

Placing a FILES= statement in the CONFIG.SYS file increases the default value for all DOS sessions. Each session can also be customized by changing the DOS_FILES setting in the DOS or WIN-OS/2 session.

F.7.20 BASEDEV=IBMKBD.SYS

This is the hardware-specific portion of the keyboard device driver. It continues to support these keyboards:

- IBM - Enhanced 101/102 Key Keyboard
- IBM - 3279 enhanced 130 Key Keyboard
- Honeywell - 101WN
- Lexmark - Enhanced 101 Key Keyboard

- Microsoft Windows Extended Key Keyboard

This driver is the median between the keyboard hardware and the base OS/2 keyboard driver. Its main function is to get the keyboard scan codes and pass them to KBDBASE.SYS for processing. It also takes care of updating the keyboard hardware as instructed by KBDBASE.SYS.

F.7.21 DEVICE=C:\IBMCOM\PROTOCOL\LANPDD.OS2

Part of MPTS, this loads support for the LAN Virtual Device Driver. The NetBIOS and IEEE 802.2 LAN virtual device driver (LAN VDD) supplied enables DOS NetBIOS and DOS IEEE 802.2 applications to share network adapters with OS/2 NetBIOS and OS/2 IEEE 802.2 applications. Windows 3.0 NetBIOS and Windows 3.0 IEEE 802.2 applications can also use the LAN VDD.

F.7.22 DEVICE=C:\IBMCOM\PROTOCOL\LANVDD.OS2

This is also part of MPTS's support for the LAN Virtual Device Driver.

F.7.23 DEVICE=C:\OS2\BOOT\TESTCFG.SYS

This driver is used during the install process to test your system's configuration. It is also used by the Selective Install process and during device driver installations. Because this driver is used by the Selective Install process, it should not be deleted.

F.7.24 DEVICE=C:\OS2\BOOT\DOS.SYS

This statement defines a device driver used to communicate between DOS and OS/2 applications running on the same system.

F.7.25 DEVICE=C:\OS2\BOOT\PMDD.SYS

OS/2 loads and uses this driver to provide pointer draw support along with POINTDD.SYS. OS/2 will not start without this line in your CONFIG.SYS file.

F.7.26 BUFFERS=90

This statement sets the number of disk buffers that the system uses. The disk buffer is a 512-byte block of storage the system uses to read and write blocks of data that do not occupy an entire sector. You can increase the speed of your system by increasing the value specified for BUFFERS. However, when you increase the number of disk buffers, you decrease your available memory. You might want to experiment with the number of buffers to get maximum performance. Additional buffers can cause some applications to run more slowly because there is less memory available for the application to keep data. More frequent read and write requests than are otherwise necessary might then result.

F.7.27 IOPL=YES

IOPL allows I/O privilege to be granted to requesting processes in OS/2 sessions. The privilege level assigned to a program determines what code segments and data

segments in memory it can access. The privilege level also limits the machine instructions a program can process.

Application programs are usually assigned privilege level 3. This means that they can call routines that run at any other privilege level. However, they can access only their own data segments and cannot issue any I/O instructions.

Programs that are granted I/O privilege run at privilege level 2. When IOPL is YES, a program assigned privilege level 2, such as a subsystem that needs to communicate directly with a specific device, is then permitted to send or receive instructions to or from that device. When IOPL is NO, this prevents I/O privilege from being granted.

You can list the specific programs that require I/O privilege. To allow I/O privileges to be granted to programs named PROC2 and PROC3, type the following in the CONFIG.SYS file:

```
IOPL=PROC2,PROC3
```

F.7.28 DISKCACHE=D,LW

This statement specifies the number of blocks of storage to allocate for control information and for use by the disk cache. For example:

```
DISKCACHE=N,LW,T,AC:x
```

Where:

- `N` specifies a number from 48 through 14400 that indicates the number of 1024-byte blocks (or 1 KB blocks) of storage to be used for control information and programs in the disk cache buffer. The value for the parameter will be set during installation and will be based upon the amount of system memory (RAM). You can reset this value to a numerical value. To set your disk cache size to 128 KB, type the following in the CONFIG.SYS file: DISKCACHE=128
- `LW` specifies whether the contents of cache memory are written immediately to disk or only during disk idle time. This parameter pertains only to disks formatted for the FAT file system. The LW (lazy-write) parameter enables writing of cache memory during disk idle time. Omitting this parameter specifies immediate writing to disk. LW is the default.
- `T` specifies a number from 4 through 128 that indicates the threshold size for the number of sectors that will be placed into cache. The default value is 4. To set your disk cache size to 64 KB with a threshold of 128 sectors, type the following in the CONFIG.SYS file:

  ```
  DISKCACHE=64,128
  ```

- `AC:x`(AUTOCHECK) specifies the drives (x) the operating system checks at startup time to determine if the file system associated with a drive is in an inconsistent state. A file system can be in an inconsistent state when files were left open. This can happen when the computer was turned off without selecting the Shutdown

choice from the menu of the desktop, or electrical power to the computer was interrupted. The operating system runs the CHKDSK program with the /F option to correct any problem caused by improper system shutdown. If you place a plus sign (+) in front of any drive letter, the drive will be checked every time the system is started:

```
DISKCACHE AC:C+DE
```

Drives C: and E: will only be checked if they were not shut down properly, but drive D: will always be checked.

The disk cache allows a portion of the system storage to be used as an additional hard disk buffer. DISKCACHE speeds up application programs that read hard disks by keeping hard disk data frequently accessed in a cache buffer. When an application program requests hard disk data that is already in the cache buffer, the disk cache sends the data directly to the application program. This method of accessing data is much faster than if the data had to be read from the disk each time.

Specifying this statement increases the speed of your system. If no DISKCACHE statement is specified, no cache storage is allocated. When you increase the size of your disk cache, you also decrease the size of available memory for other usage. For this reason, you may want to experiment with the cache size to get maximum performance.

Disk cache sizes are based on the amount of memory that is available in the system and how many partitions are formatted for the FAT file system, not on the disk size.

Default sizes for HPFS CACHE and DISKCACHE are set up by the installation program. The dependencies are physical memory and the number of partitions formatted for either file system.

Note: You need to select Shutdown from the menu of the desktop before turning off your system. Failure to do so can cause loss of data if the contents of the cache buffers have not been erased and written to disk.

The DISKCACHE default cache sizes are as follows:

- For systems with 4 MB or less of memory, the value N is set to 48 KB.
- For system memory above 4 MB and up to 5 MB, the value N is set to 64 KB if more DASD is formatted for HPFS than for FAT. If more DASD is formatted for FAT than for HPFS, the value N is set to 48 KB.
- For system memory above 5 MB and up to 6 MB, the value N is set to 128 KB.
- For system memory above 6 MB and up to 8 MB, the value N is set to 512 KB.
- For systems with more than 8 MB of memory, the value N is set to 5% of the memory size up to a limit of 4 MB.

The amount of storage required for control information is determined by the total size of one or more hard disks. When the amount of storage you specify in the DISKCACHE statement is not available, the system displays an error message. When the amount of storage you specify in the DISKCACHE statement is not sufficient to support the total hard disk size, the disk cache does not work. The disk cache is allocated at system startup, and there is no dynamic adjustment of its size.

It is recommended that the threshold size be set at 32 unless the software product you are using is disk intensive and the manufacturer supplies information on the block size required. If the block size is defined in terms of byte count, divide the byte count by 512 and round up the quotient to the nearest whole number to determine the threshold value.

F.7.29 MAXWAIT=3

Sets the amount of time a ready-to-run thread waits before the system assigns it a higher priority. The syntax for the line is:

```
MAXWAIT=X.
```

where X specifies the number of seconds that must elapse before a regular class thread that is waiting to access the processor receives an increase in priority. You can specify a number from 1 through 255. The smaller the value, the greater the system overhead.

To cause a process to wait up to 15 seconds before it receives a temporary increase in priority, type the following in the CONFIG.SYS file:

```
MAXWAIT=15
```

Note: MAXWAIT has no effect if the PRIORITY command is set to ABSOLUTE.

The system limits the time that a regular-class thread waits to be processed. When the time limit is reached, the system raises the priority of the thread to give it a chance to be processed.

The most appropriate amount of time to set depends on the number of applications that must run concurrently and the kinds of activities the applications perform (the system default is 3 seconds). Experiment with this time to improve overall system performance.

F.7.30 MEMMAN=SWAP,PROTECT

OS/2 can run more programs and use more data than can actually be stored in memory (RAM) at any given time. This is done by swapping large amounts of memory to your hard disk and then reading the data back into memory when needed. This is called *virtual* memory. For example, if you have 4 MB of memory you will see lots of disk activity while you are working with your system. A lot of this is OS/2 swapping memory to and from your hard disk. Lots of memory swapping slows down your system and can cause your hard disk to fragment quicker than normal.

The MEMMAN command controls the swap process. The syntax is:

```
MEMMAN=SWAP (or NOSWAP), MOVE (or NOMOVE),PROTECT,COMMIT
```

Where:

- SWAP or NOSWAP is to turn virtual memory on or off. The default is SWAP. To turn off virtual memory, which is *not* recommended, the CONFIG.SYS file line should be MEMMAN=NOSWAP.
- MOVE or NOMOVE are provided for OS/2 1.3 compatibility. MOVE provides compatibility, NOMOVE doesn't.
- PROTECT allows the allocation and use of protected memory for certain DLLs. This is done to protect those DLLs from being corrupted by an errant program. PROTECT is the default.
- COMMIT will have OS/2 allocate space in the swap file whenever a program commits memory, that is, a page in the swap file is allocated for every page of memory committed by a program, even if the data never actually gets swapped out. Your system should be more stable, but it will be slower also, since your swap file will grow when it doesn't have to. If you use this parameter, increase the size of your SWAPPER.DAT file (see SWAPPATH line below) by the amount of memory you are likely to use when using the COMMIT parameter.

  You can also use the COMMIT parameter another way. Without COMMIT set, the minimum free value noted in your SWAPPATH specifies the point at which OS/2 gives you a message warning that your disk space is running low. When you set COMMIT, the minimum free value noted in your SWAPPATH statement becomes the amount of hard disk space that will always remain free on the swap file partition. Thus, with COMMIT set, you can never run out of disk space on your swap file partition.

F.7.31 SWAPPATH=C:\OS2\SYSTEM 2048 2048

SWAPPATH specifies the size and location of the swapper or virtual memory file (SWAPPER.DAT), which is used to temporarily store data segments that the system has removed from physical memory to satisfy a request for memory. If swapping is enabled, use this command to specify the location and size of the swapper file.

Note: After you have relocated the swapper file to a subdirectory or separate partition, shut down and restart your system, and then erase the old swapper file from its previous location.

The syntax for the command is:

```
SWAPPATH =X:\PATH MINFREE INITIAL
```

Where:

- X:\PATH is the drive and path where the SWAPPER.DAT is located. C:\OS2\SYSTEM is the default.
- MINFREE specifies the amount of free space in KB that can remain on the disk before a warning notifies you that the swapper file has increased to a size that leaves less than this amount on the disk. The warning message will be a black screen with the

message `Your swapper.dat is full`. You can specify a value from 512-32,767 for MINFREE. Be sure to leave a space between the path and the MINFREE value. This value does not define the amount of free space on the disk at any given time, because applications can cause less free space to be available on the disk than what is specified by MINFREE.

- `INITIAL` specifies the size of the swapper file initially allocated by the operating system at the time of installation. You can modify the initial size of the swapper file up to the size of the free space on the partition containing the SWAPPER.DAT. However, you must leave space on the partition equal to the MINFREE value. If you find that your swapper file is consistently over the initial size, increase to the initial size to a higher size for example if the SWAPPER.DAT is consistently 10 MB, increase the initial size to 10240 (KB). This will reduce overhead on the system.

The MINFREE and INITIAL sizes are determined by how much memory (RAM) is installed on the OS/2 workstation:

MEMORY IN MB	MINFREE (KB)	INITIAL SIZE (KB)
4	4096	6144
5	4096	5120
6	4096	5120
7	2048	4096
8	2048	4096
9	2048	3072
10	2048	3072
11 - 32	2048	2048

F.7.32 BREAK=OFF

This statement instructs DOS to check if the Ctrl and Break keys have been pressed before carrying out a program request.

Enter the BREAK command at the DOS command prompt to display the current status. BREAK instructs the system to check if you pressed the Ctrl and Break keys together before the system carries out a program request. Pressing and holding the Ctrl and Break keys together stops a command from completing its task. BREAK can be entered in the CONFIG.SYS file, in a batch file, or at the command prompt.

Specify ON to check to see if you pressed the Ctrl and Break keys together. In OS/2 sessions, the check for Ctrl+Break is always set to ON, and you cannot change it.

To check whether Ctrl+Break has been pressed only when output is written to your screen or printer, or when input is read from your keyboard, add `BREAK=OFF` to your CONFIG.SYS file. This is the default.

To have the system check for Ctrl+Break when you request it, put `BREAK=ON` in your CONFIG.SYS file.

F.7.33 THREADS=1024

This statement sets the maximum number of independent actions, known as threads, for OS/2 sessions.

Applications consist of a series of instructions. The processor reads each instruction and performs the associated activity. The sequential execution of the instructions by the processor is called the thread of execution. More than one thread of execution can exist within a single process. Typically, OS/2 applications contain many threads.

Several threads can be ready to execute at the same time, but only one thread at a time can have access to the processor. Access to the processor is managed by the system scheduler, which assigns each thread a priority. The thread that has the highest priority, and that is ready to run, is allocated to the processor. For example, if a thread is being processed, and another thread with a higher priority becomes ready to run, the system stops processing the thread with the lower priority and allocates the processor to the thread with the higher priority. That thread is processed until it relinquishes control of the processor or until a thread of higher priority is ready to run.

The system supports a maximum of 4095 threads, which it allocates to itself and the applications running on it. Reducing the number of threads while running complex applications or system extensions can force activities that could be performed concurrently to be performed serially, thus slowing performance. If no THREADS statement is in the CONFIG.SYS file, the default number of threads is 64.

F.7.34 PRINTMONBUFSIZE=134,134,134

The PRINTMONBUFSIZE= statement sets parallel-port device-driver buffer size, enabling you to increase the size of the OS/2 parallel-port device-driver buffer and thereby increase performance of data transfer to devices connected to the parallel port. This device-driver monitor buffer is used only if a printer character monitor is active. The parallel port device driver will allocate and register its monitor chain buffer based upon the value specified.

If you increase this value, additional system memory is used. Therefore, you should increase the value only when using a printer character monitor that can take advantage of the additional memory.

The syntax is:

```
PRINTMONBUFSIZE=X,X,X
```

Where `X` specifies the size of the parallel-port device-driver buffer. Each X corresponds to LPT1, LPT2, and LPT3 character monitor buffer size (in bytes) respectively. The minimum value permitted is 134 and the maximum value is 2048. If you specify a value that is outside the valid range, a default value of 134 is used. To set the parallel-port device-driver buffer size for LPT1 as 2048 bytes, for LPT2 as 134 bytes, and for LPT3 as 134 bytes, type the following in the CONFIG.SYS file:

```
PRINTMONBUFSIZE=2048,134,134
```

F.7.35 COUNTRY=001,C:\OS2\SYSTEM\COUNTRY.SYS

The COUNTRY statement is used to select the default locale for applications using the existing OS/2 NLS APIs. It is not used for applications that use the OS/2 Unicode locale support. OS/2 Unicode locale applications use the value specified by SET LANG.

It identifies the following information for a country:

- Date and time format
- Decimal separator
- Character-case map table
- Collating-sequence table
- Double byte character set (DBCS) environment vector for double byte characters.

The country-dependent information (for example, the code page) used by OS/2 is determined by the COUNTRY statement that is active in the system. The following table lists the country codes and the code pages that are fully supported (country, video, keyboard) for that country. The primary and alternate are selected by install, and can be reversed. The other code page can be substituted for the primary or alternate code page.

Country Name	Country Code	Primary CP	Alt CP	Other CP	
United States	1	850	437	1004	
Canada - French	2	850	863	1004	
Latin America	3	850	437	1004	
Russia	7	866	850	915	
South Africa	27	850	437	1004	
Greece	30	869	850	813	*
Netherlands	31	850	437	1004	
Belgium	32	850	437	1004	
France	33	850	437	1004	
Spain	34	850	437	1004	
Hungary	36	852	850	1004	
Italy	39	850	437	1004	
Romania	40	852	850	1004	
Switzerland	41	850	437	1004	
Austria	43	850	437	1004	
United Kingdom	44	850	437	1004	
Denmark	45	850	865	1004	
Sweden	46	850	437	1004	
Norway	47	850	865	1004	
Poland	48	852	850		
Germany	49	850	437	1004	
Brazil	55	850	437	1004	

Australia	61	850	437	1004	
New Zealand	64	850	437	1004	
Thailand	66	874	850		*
Japan	81	943	850	942	*
Korea	82	949	850	944	*
China (PRC)	86	1381	850	946	*
Taiwan (ROC)	88	950	850	948	*
Turkey	90	857	850	1004	
Portugal	351	850	860	1004	
Ireland	353	850	437	1004	
Iceland	354	850	861	1004	
Albania	355	850	437		
Finland	358	850	437	1004	
Bulgaria	359	915	850	855	
Lithuania	370	921	850		
Latvia	371	921	850		
Estonia	372	922	850		
Serbia/Montenegro	381	855	850	915	
Croatia	385	852	850		
Slovenia	386	852	850		
Bosnia/Herzogovina	387	852	850		
FYR Macedonia	389	855	850	915	
Czech	421	852	850		
Slovakia	422	852	850		
Arabic Speaking	785	864	850	437	*
Israel	972	862	850	437	*

Note: * Arabic, Greek, Hebrew, Thai, and DBCS code pages are not fully supported in OS/2 versions other than those specifically designed for these countries.

Code page 1004 matches the Windows Latin 1 code page, and can be used to create exact interchange between the OS/2 and Windows environments. This code page does not contain box characters, and may not work for all applications.

F.7.36 SET KEYS=ON

When using an OS/2 command line, KEYS tells it whether to remember previous keystrokes so they can be recalled with the up arrow key (like DOS's DOSKEY command). OS/2 maintains a 64KB buffer for storing keystroke history. KEYS can be ON (default) or OFF. To find out whether KEYS is on or off, simply type `KEYS` without a parameter from an OS/2 command prompt.

F.7.37 SET BOOKSHELF=

This command points to the online documentation (INF files) provided with OS/2 or other OS/2 programs.

F.7.38 SET SOMIR= and SET SOMDDIR=

SOM is an acronym for IBM's System Object Model. OS/2's object orientation is based upon this technology and in OS/2 Warp 4, the Workplace Shell is built on SOM Version 2 with Distributed SOM enabled. This SET statement sets the path to various IR files.

F.7.39 SET ULSPATH=C:\LANGUAGE

This statement sets the path to the universal language library as part of NLS support.

F.7.40 SET LOCPATH=C:\IBMI18N\LOCALE;C:\LANGUAGE\LOCALE

This statement sets the path to the I18N code as part of NLS support.

F.7.41 BASEDEV=TIMER0.SYS

This driver is required to support multimedia audio devices.

F.7.42 REM SET DELDIR=C:\DELETE,512;

The SET DELDIR= statement is preceded by REM and is ignored in a default CONFIG.SYS file. If you remove the REM command, any files that are deleted from the system by an application or from a command prompt will be placed in the directory specified by the DELDIR statement. These files will take up space in the hard disk of your system up to the amount specified in the DELDIR statement. The 512 indicates the maximum kilobytes of files that will be stored in the DELETE directory. If the number of deleted files exceeds the maximum KB that you specified, then files are automatically removed from the directory on a first-in-first-out basis.

Using this command will have an impact on system performance. File operations in particular will be slower.

F.7.43 BASEDEV=PRINT01.SYS and BASEDEV=PRINT02.SYS

The PRINT01.SYS device driver programs the parallel port on ISA and EISA bus systems. The PRINT02.SYS device driver programs the parallel port on Micro Channel systems. The parallel-port device driver services requests for the PRN, LPT1, LPT2, and LPT3 devices.

The default transmission protocol is the polling transmission method. You can change the transmission method to the interrupt method by specifying the /IRQ switch (that is, `BASEDEV=PRINT01.SYS /IRQ`). The /IRQ switch can be specified in any combination of uppercase and lowercase characters.

In addition to the polling and interrupt-driven methods of transmission, the PRINT02.SYS parallel-port device driver supports the DMA method of transmission. When the Micro Channel parallel port supports the DMA method of transmission, the parallel-port device driver uses this method of transmission because of its increased performance, regardless of whether polling or interrupt is specified. In all other cases, the method of transmission is either the default (polling) or the alternate (interrupt) method specified.

F.7.44 BASEDEV=IBM1FLPY.ADD and BASEDEV=IBM2FLPY.ADD

This IBM1FLPY.ADD is for ISA and EISA standard diskette drives; the IBM2FLPY.ADD is for Micro Channel standard diskette drives.

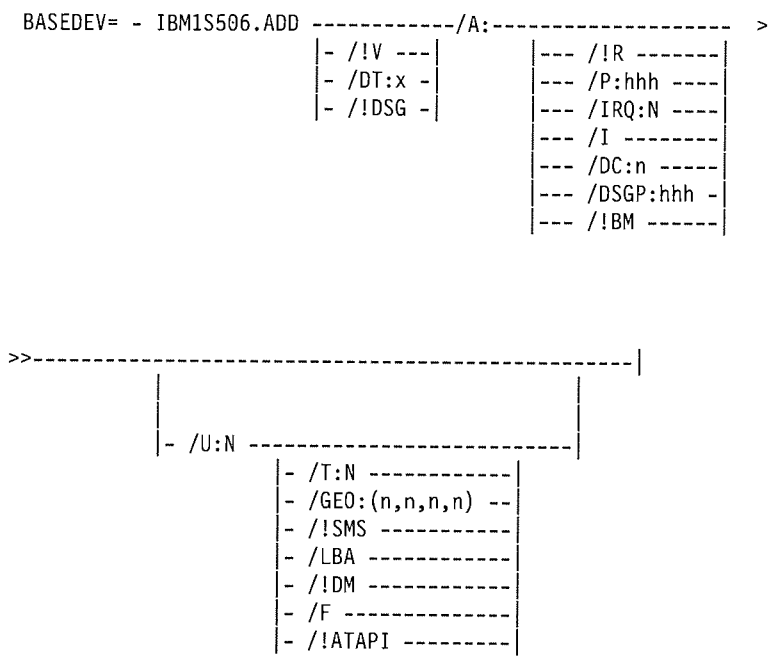
The IBM1FLPY.ADD in most case does not need any configuration. However, there are configuration parameters available if needed. Type `help ibm1flpy` in an OS/2 Window to identify these.

The IBM2FLPY.ADD does not need any configuration and has no parameters.

F.7.45 BASEDEV=IBM1S506.ADD

This device driver provides support for MFM, RLL, ESDI, and IDE hard disk controllers on non-Micro Channel industry standard devices.

In the majority of cases, the IBM1S506.ADD driver will determine parameters automatically. There are many parameters for this basedev:



Where:

- `/A:N` is the adapter number. /A:0 indicates that the parameters that follow apply to the primary disk controller. `/A:1` indicates that the parameters that follow apply to the secondary disk controller.

- /U:N is the unit ID. Unit 0 indicates parameters that follow apply to Drive 0. Unit 1 indicates parameters that follow apply to Drive 1.
- /!V indicates verbose mode. Displays controller status and drive geometry information during OS/2 initialization.
- /DT:x is the DMA Type. Specifies the DMA type x of F or B.
- /!DSG specifies to disable scatter-gather. Allows you to disable the DMA scatter-gather mechanism. The default is enabled.
- /!R indicates whether to disable adapter resets. In most cases, resets assist in recovering from transient hardware problems such as lost interrupts, timeouts, and unsupported commands. However, for some ESDI adapters, options set by vendor-unique commands, such as sector sparing, might be lost after a reset. Setting this parameter is recommended for ESDI adapters with disks formatted using sector sparing.
- /P:hhh is the base port address (HEX). Overrides the default base port address for this adapter. Ports are still assigned and in this case would be 120-127 and 326. The default port addresses for Adapter 0 is 1F0 and for Adapter 1 is 170.
- /IRQ:N is the IRQ level (DECIMAL). Overrides the default IRQ level for this adapter. The default IRQ level for Adapter 0 is (14) and for Adapter 1 is (15).
- /I specifies to ignore the adapter. The driver automatically attempts to locate and initialize both the primary and secondary adapters. In some cases, other disk controllers might appear between the primary and secondary IDE controllers. In these cases, the system should be configured as follows:

```
BASEDEV=IBM1S506.ADD /!V /A:1 /I
BASEDEV=MOREDASD.ADD
BASEDEV=IBM1S506.ADD /!V /A:0 /I
```

- /DC:n is the DMA Channel. Specifies the DMA Channel n which can be 3, 5, 6, or 7.
- /DSGP:hhh is the DMA scatter-gather port. This parameter specifies the DMA scatter-gather port base. The default is 400h.
- /!BM disables the Bus Master DMA.
- /T:N indicates the error retry time in seconds (DECIMAL). It indicates the total allowable error recovery time for a request. Error recovery times less than 5 seconds will be ignored. This parameter defaults to 30 seconds. A shorter interval might be desirable for fault-tolerant applications.
- /GEO:(n,n,n,n) is the drive geometry override (DECIMAL). Indicates the Cylinder/Head/Sector geometry for the drive. This parameter is the Write Precompensation Cylinder, which can be omitted for drives that do not require precompensation. As an alternate format, standard BIOS drive types can be used. Types 0-47 are supported. User-defined types 48 and 49 should be entered directly in the previous format. When specified, this parameter overrides other geometry

sources. If this parameter is absent, other geometry sources discussed above will be used.

- /!SMS disables set multiple support (block mode). The IBM1S506 driver will automatically enable set multiple support if a drive indicates it supports this feature. The /V parameter indicates whether Block Mode support has been enabled for a particular drive. This feature improves performance of some IDE drives by allowing the drive to transfer more than 512 bytes of data per interrupt to the host CPU. Some older IDE drives and caching IDE controllers may not support this feature properly. In this case specifying the /!SMS switch will disable this support.
- /LBA is for Logical Block Support (LBA). Enables LBA support for IDE drives that support this option. The /!V parameter indicates whether this feature has been enabled on a particular device.
- /!DM is used to prevent the OS2DASD.DMD device driver from managing the hard disk drive indicated by the /U parameter.
- /F forces the presence of this unit even if the hardware is not present on the system.
- /!ATAPI is for ATAPI Recognition. This parameter tells the system that the unit is to be treated as an ATAPI CD-ROM.

In all cases, options prefaced with ! can be used with the ! modifier to explicitly disable the option. Options are valid both with and without the ! modifier.

F.7.46 BASEDEV=XDFLOPPY.FLT

This device driver provides support for eXtended Density Format (XDF) diskettes. This device driver is required to use the XDFCOPY command and to install this version of OS/2 using the OS/2 Installation diskettes. This device driver has no parameters.

F.7.47 BASEDEV=OS2DASD.DMD

The device manager transport layer for DASD (that is, hard disks) devices. OS2DASD is always required and is automatically installed in the CONFIG.SYS file. This device driver has no parameters.

F.7.48 RUN=C:\OS2\SYSTEM\HYBERSET.EXE

This is part of the support for the DEDICATED DOS/WINDOWS session feature.

F.7.49 SET EPMPATH=C:\OS2\APPS;

This is used by the Enhanced Editor (EPM.EXE) to locate its files.

F.7.50 PROTECTONLY=NO

The PROTECTONLY=YES statement allows memory under 640 KB, which is normally used for DOS programs, to be available for OS/2 programs. When PROTECTONLY=YES, you cannot run programs in DOS sessions. If you later decide

that you want to run DOS programs in the lower 640 KB of memory, specify PROTECTONLY=NO. This allows you to use both DOS and OS/2 programs.

F.7.51 SHELL=C:\OS2\MDOS\COMMAND.COM C:\OS2\MDO

This installs the DOS command processor, COMMAND.COM. By putting a /P at the end of the line. For example:

```
SHELL=C:\OS2\MDOS\COMMAND.COM C:\OS2\MDOS /P)
```

The command line processor is kept in memory until shutdown. This is also the line where you can also specify the size of the DOS environment variable. The range is 160 through 32768. For example, to set a 1024-byte environment you would add the following to the end of the SHELL command line:

```
/E:1024
```

F.7.52 FCBS=16,8

Determines file-control-block (FCB) management information for DOS sessions. This statement has no effect in OS/2 sessions.

The options for the command are:

```
FCBS=M,N
```

Where:

- M specifies a number from 1 through 255 that indicates the total number of file control blocks (FCBs) that can be open at the same time. To specify 7 as the total number of file control blocks that can be open at one time, type the following in the CONFIG.SYS file:

  ```
  FCBS=7
  ```

- N specifies the number of files opened by FCBs that cannot be closed automatically by the system when a program tries to have more than M files opened by FCBs at one time. The first n files opened by FCBs are thus protected from being closed. The range of values for N is from 0 through 255. The value for N must be less than or equal to M. To set to 7 the total number of file control block files that can be open at one time, and set to 2 the number protected from being closed, type the following in the CONFIG.SYS file:

  ```
  FCBS=7,2
  ```

A file control block (FCB) is a record that contains all of the information about a file (for example, its structure, length, and name). If a program tries to open more than the number of files specified in the FCBS statement, the system closes the least-recently used file control block and opens the new file.

Some application programs use file control blocks to create, open, delete, read, and write to files. New programs written for the operating system usually use internal file IDs (handles) for file input/output.

If a program tries to open more than the number of file control blocks specified in the FCBS statement, the system closes the least-recently used FCB and opens a new file. The files that are protected from being closed are not included in the list of least-recently used FCBs. If a program tries to read or write to a file that has been closed because it is the least-recently used FCB, the system displays an error message.

In addition, the value of the first number must be greater than or equal to the value of the second number. If you set the two values equal to each other in the FCBS statement and a program tries to open more than the total number of file control blocks you specified, no files can be closed. If a program tries to open more than the number of file control blocks you specified, no new files are opened.

F.7.53 RMSIZE=640

Specifies the highest storage address allowed for the DOS operating environment. If you specify a number that exceeds the amount of memory allowable for your system configuration, the system sends you an error message and ignores the statement. It then automatically calculates the largest default value for your system.

If you do not have an RMSIZE statement in your CONFIG.SYS file, the default is the total amount of low memory installed (either 512 KB or 640 KB).

If you decided to specify PROTECTONLY=NO, you can further reduce the size of the DOS environment by specifying RMSIZE. This allows you to make the size of the DOS environment smaller than the maximum amount available if all the remaining memory below 640 KB were used for DOS sessions.

This statement specifies the highest storage address allowed for a DOS session. It is important to note that if you specify a number that exceeds the amount of memory allowable for your system configuration, the system sends you an error message. This message states that the value was not acceptable and ignores the statement. If you do not specify a RMSIZE statement in your CONFIG.SYS file, the default depends on the total memory installed. If this total is 640 KB or less, then the default size is the total memory minus the minimum required for protect-mode operations. If this total is 1024 KB or greater, the default size is the amount of memory installed below 1024 KB, either 512 KB or 640 KB.

This is the largest usable size for DOS sessions at which your system can operate. If you enter a size that is too large for your system, the system displays an error message during startup and automatically calculates the largest default value possible.

F.7.54 DEVICE=C:\NETWARE\VIPX.SYS

As part of the NetWare Client, this statement loads IPX support for multiple virtual DOS machines. It is required to allow multiple DOS boxes on an the network and to OS/2 workstation to run the NetWare DOS based utilities.

F.7.55 DEVICE=C:\NETWARE\VSHELL.SYS GLOBAL

As part of the NetWare Client, this statement loads the network shell. It is automatically used for all DOS and WIN-OS/2 sessions that require it. The GLOBAL can be also be changed to LOCAL. Here is an explanation of the differences between `Global` and `Local`:

- `Global`: all DOS, MS Windows, and OS/2 sessions set up for global login support share a single login to a NetWare server. Drives that are mapped in one session apply to the other sessions. A port captured in one session is also captured in other sessions. This is useful in environments where the number of connections is carefully monitored.
- `Local`: all DOS and MS Windows sessions set up for private login support have their own logins to a NetWare server. Drive mappings and port captures from one session do not apply to the other sessions. This is useful in environments where users need more than one connection to a server and where users need logins from DOS or MS Windows sessions to be separate from logins from OS/2 sessions.

The setting here sets up the default for the whole workstation. If you need to change an individual DOS or WIN-OS/2 session, you can do this by going into the DOS or WIN-OS/2 settings and changing NETWARE_RESOURCES to either LOCAL or GLOBAL. Read the Online NetWare information by clicking on **Connections=> Network=> Network Services=> NetWare Services+> Netware Client**.

F.7.56 DEVICE=C:\OS2\MDOS\VEMM.SYS

This statement provides Expanded Memory Manager (EMM) for DOS sessions. VEMM.SYS is a virtual device driver that provides the Lotus/Intel/Microsoft (LIM) Version 4.0 Expanded Memory Specification (EMS) emulation to DOS sessions. VEMM.SYS allows DOS applications to allocate and map expanded memory on the Intel 8086 family of computers.

There is only one option for this line:

```
DEVICE=C:\OS2\MDOS\VEMM.SYS N
```

The `N` specifies, in KB, the limit on the amount of Expanded Memory Manager (EMM) memory available to each DOS session. If more than 32 MB is specified, 32 MB is used. Specifying 0 will disable EMM for all DOS sessions unless overridden. The value can be overridden for a DOS session by specifying an EMS memory limit in the DOS Settings section of a DOS command-prompt object on the desktop. The default is 2048 KB (2 MB).

Any DEVICE=C:\OS2\MDOS\VEMM.SYS N statements must be listed before any DEVICE=C:\OS2\MDOS\VXMS.SYS statements in the CONFIG.SYS file since VEMM searches for unused addresses between 640 KB and 1 MB.

F.7.57 DOS=LOW,NOUMB

This is a standard DOS command that lets you control how DOS itself uses memory. The default is DOS=LOW,NOUMB and is considered by many to be the best setting as it conserves memory for OS/2. DOS=HIGH (including, UMB) reduces available memory for OS/2, but increases the available memory in EVERY DOS session. Few DOS sessions need maximum memory. Also remember that you can move DOS HIGH for a specific program by changing that programs settings. This is done in the program's DOS settings notebook and is likely the better way to go. Finally, keep in mind that in OS/2 many device drivers are not taking up room in the 640 KB DOS area. So you generally have more memory in the typical OS/2 DOS session than in a standard DOS session.

F.7.58 DEVICE=C:\OS2\MDOS\VXMS.SYS /UMB

VXMS.SYS is a device driver that provides Extended Memory management to DOS sessions. XMS allows DOS programs to access more than one MB of memory.

There are five switches available:

- `/UMB` is the upper memory block support in DOS sessions.
- `/NOUMB` indicates no upper memory block support.
- `/XXMLIMIT=m,n` indicates the total system wide memory limit.
- `/HMAMIN=m` sets the minimum request size for high memory, from 1 KB to 63 KB.
- `/NUMHANDLES=m` sets the number of handles in each DOS session, from 1 to 128.

The VXMS.SYS device must be listed in your CONFIG.SYS file after the VEMM.SYS device.

F.7.59 DEVICE=C:\OS2\MDOS\VDPMI.SYS

This statement provides virtual DPMI (DOS Protect Mode Interface) memory for DOS and WIN-OS/2 sessions.

F.7.60 DEVICE=C:\OS2\MDOS\VDPX.SYS

This is the protected mode to real mode device driver for DPMI applications.

F.7.61 DEVICE=C:\OS2\MDOS\VWIN.SYS

This statement provides seamless Windows support for WIN-OS/2.

F.7.62 DEVICE=C:\OS2\MDOS\VW32S.SYS

This statement provides Microsoft WIN32S API support. In OS/2 Warp 4, this is up to Version 1.25a.

F.7.63 DEVICE=C:\OS2\MDOS\VMOUSE.SYS

This statement provides mouse support for DOS and WIN-OS/2 sessions.

F.7.64 DEVICE=C:\OS2\BOOT\POINTDD.SYS

This provides mouse-pointer draw support. Text modes 0, 1, 2, 3, and 7 and graphic modes D, E, F, and 10 are supported.

F.7.65 DEVICE=C:\OS2\BOOT\MOUSE.SYS

This statement provides support for a mouse or track ball. The driver identifies the type of mouse you have and which COM port it is on.

The driver has a few parameters:

```
DEVICE=C:\OS2\BOOT\MOUSE.SYS QSIZE=q
                              TYPE=name
                              RELAXED
```

QSIZE is a number from 1 to 100 which indicates how many mouse actions are to be saved when you execute mouse actions faster than your system can handle them.

TYPE specifies the name of the device driver for the mouse. For example:

```
PCLOGIC$        PC Mouse Systems Devices
PCLOGIC$        Logitech Pointing Devices
VISION$         Visi-On Mouse
```

RELAXED (which would be placed after QSIZE) can be used with any mouse when the pointer is jumping randomly about the screen. Don't use this parameter unless you are experiencing this problem.

The MOUSE.SYS statement must come before COM.SYS, but after POINTDD.SYS, because COM.SYS will take over any unused COM port. If COM.SYS takes over the COM ports before MOUSE.SYS is loaded, MOUSE.SYS will not have any COM ports available, thus no mouse support.

F.7.66 DEVICE=C:\OS2\BOOT\COM.SYS

This statement allows OS/2 application programs or system programs, such as the OS/2 Spooler, to use serial devices.

Device drivers that support other devices attached to serial ports COM1 through COM4 must be listed before the DEVICE=C:\OS2\BOOT\COM.SYS statement in the CONFIG.SYS file, or the port will be unavailable to COM.SYS.

COM.SYS, by default, supports two serial ports (COM1 and COM2) - you do not need to configure these further. Further configuration is required only if you want to change the default settings for COM1 and COM2 or you wish to add COM3 and COM4. The syntax for the driver is as follows:

```
DEVICE=C:\OS2\BOOT\COM.SYS (N,Addr,IRQ,S) (N,Addr,IRQ,S)
```

Where:

- `N:` is COM port number (1, 2, 3, or 4).
- `Addr` is the COM port address in hex number (for example, 3e8, 2e8, 3320, etc.).
- `IRQ` is the IRQ level in decimal number (from 1 to 15).
- `S` is an unexpected interrupt handling value. Use `D` to deinstall the COM.SYS device driver if more than 1000 unexpected interrupts occur consecutively. Use `I` to ignore unexpected interrupts. (The default is D.) This value is optional.

For ISA/EISA bus computers, this parameter as mentioned must be specified to support COM3 and COM4 ports. The COM.SYS device driver assigns the following to COM1 and COM2:

```
COM1: address 3f8, IRQ 4
COM2: address 2f8, IRQ 3
```

For Micro Channel bus computers, you do not need to specify this parameter unless the computer has a COM port with a nonstandard COM port address or IRQ.

OS/2 Warp 4 cannot share the IRQ level in ISA/EISA bus computers. Therefore, the IRQ level must be unique for each COM port on these systems. IRQ level is determined by the hardware. Check the IRQ level of the COM port before setting the parameter. On Micro Channel bus computers, the IRQ level can be shared and no parameter is required to support COM3 or COM4 ports. However, in order to ignore unexpected interrupts, you need to specify the value I.

COM.SYS supports application programs with the following RS-232C (serial device) interface functions:

- Duplex communication
- Automatic flow control (XON/XOFF) for both transmit and receive
- Various modem line handshaking modes
- Standard and nonstandard baud rates
- Receive data-error character replacement.

It also supports these system features:

- Multiple active COM ports
- Read and write request queueing
- Interrupt-driven I/O processing
- Internal transmit and receive data buffers
- Several device status query functions.

F.7.67 DEVICE=C:\OS2\MDOS\VCOM.SYS

This statement provides for use of serial ports for DOS and Windows sessions. This must appear after the COM.SYS driver.

If you are using COM3 and/or COM4, add the appropriate parameters to the COM.SYS line only. It is not necessary to add any parameters to this line. VCOM.SYS inherits its parameters from the COM.SYS line.

F.7.68 SET LANG=EN_US

This statement sets the LANG environment as part of NLS support.

F.7.69 SET TZ=EST5EDT

This statement selects the time zone to be used for locale-based applications. The syntax for this line is:

```
SET TZ=sss # ddd
```

Select the number and name for the time zone to be used in converting times to local time. The time zone consists of three basic elements:

- `sss` is the name of the standard time zone. This is a string of at least three characters. It can contain spaces, but cannot contain numbers, or the + or - sign.
- `#` is the amount of change from UT (GMT). This is normally a number with n optional leading plus (+) or minus(-). Positive times are to the west; negative times are to the east. Minutes can be specified with a preceding colon. 5.5 hours east of Greenwich Mean Time (GMT) is specified as -5:30.
- `ddd` The name of the daylight or summer time zone. This is similar to the standard time zone name. This should not be used if no summer (daylight) time is used.

To set the time zone for the central United States, which is in the Central Standard Time, type the following in your CONFIG.SYS file:

```
SET TZ=CST5CDT
```

The following is a list of common time zone names.

Note: Many others are possible.

```
EST5EDT    -   US Eastern Time
CST6CDT    -   US Central Time
MST7MDT    -   US Mountain Time
PST8PDT    -   US Pacific Time
AST9ADT    -   US Alaska Time
HST10HDT   -   US Hawaii Time
AST4ADT    -   Atlantic Time (Canada)
GMT0BST    -   United Kingdom
CET-1CES   -   Central Europe
EET-2EES   -   Eastern Europe
```

F.7.70 CODEPAGE=437,850

This statement selects a system code pages (character encoding) to be used by the OS/2 operating system. You must include the appropriate DEVINFO statements for keyboard and video in the CONFIG.SYS file.

The syntax for this line is:

```
CODEPAGE = xxx,yyy
```

Where:

- XXX specifies the code page number.
- YYY specifies the secondary code page.

When your computer displays output or accepts input, the characters used are defined by a code page. Each character has a number between 1 and 255 assigned to it. For example, character number 162 will show a o-acute in the multilingual code page 850, but will show an omega in the Greek code page 869. You should normally use the primary code page for your country.

The default US code page is now 850 (multilingual). We recommend that you use this code page because it supports all of the Western European languages and enhances interchange of mail and documents. Some applications will not work correctly because they expect the old US code page (437) to be used. You might also have old files that are encoded using code page 437. You can switch between the primary and alternate code pages using the Change Code Page (CHCP) command.

Some Asian countries have more than 256 characters and therefore use up to two bytes to represent a character. This is called a double byte character set (DBCS). DBCS code pages and fonts are only partially supported on American or European systems.

In the OS/2 operating system, a program or user can change the current code page. Two code pages can be active simultaneously in the machine. The code pages for process, video, and keyboard can be set independently.

```
437       United States (old)
813       Greece
850       Latin 1 - Multilingual
852       Latin 2 - Eastern Europe
855       Cyrillic
857       Latin 5
860       Portugal
861       Iceland
862       Israel
863       Canadian French
864       Arabic
865       Nordic
866       Russia
869       Greece
```

```
874       Thai
915       Cyrillic
921       Baltic
922       Estonia
942       Japan
943       Japan JIS-90
949       Korea
950       Taiwan (ROC)
1004      Windows Latin 1
1381      China (PRC)
```

Code page 1004 can be used for almost all countries that accept code page 850. It has the Latin 1 (Western European) character set that matches that used by Windows. This code page can be used in an OS/2 process to help interchange with Windows applications. This code page is missing box characters, and some applications will not work correctly when using it. We recommend that code page 1004 be used as an alternate code page, and using code page switching to it for those applications that benefit from the interchange with Windows applications.

F.7.71 DEVINFO=KBD,US,C:*\KEYBOARD.DCP

This statement prepares a keyboard for system code page switching.

The syntax for the line is:

```
DEVINFO = KBD,layout,X:\path\filename
```

Where:

- `layout` specifies the keyboard layout. The values are:

```
AR            Arabic
AR470         Arabic 101
BA            Bosnia/Herzegovina
BE            Belgium French
BG            Bulgaria
BG241         Bulgaria 241
BR            Brazil
BR274         Brazil 101
CA            Canada
CF            Canada French
CZ            Czech
GR            Germany
DE453         Germany
DK            Denmark
EE            Estonia
GK            Greece
EL459         Greece 101
SP            Spain
SU            Finland
FR            France
```

HR	Croatia
HU	Hungary
HE	Israel
IS	Iceland
IS458	Iceland 101
IT	Italy
IT142	Italy extended
JP	Japan
KR	Korea
LA	Latin America
LT	Lithuanian
LV	Latvian
MK	Macedonia (FYR)
NL	Netherlands
NO	Norway
PL	Poland
PL457	Poland Progammer's
PO	Portugal
RO	Romania
RU443	Russia
RU441	Russia 443
SG	Switzerland German
SF	Switzerland French
SK	Slovakia
SL	Slovenia
SQ	Albania
SR	Serbia/Montenegro
SV	Sweden
TH	Thailand
TR	Turkey
TR440	Turkey
TW	Taiwan
UK	United Kingdom
UK168	United Kingdom alternate
US	United States
USDV	US English Dvorak
USDVL	US Left handed
USDVR	US Right handed
UX	US International

- `Drive, Path, Filename` specify the complete name of the file, including its extension, that contains the keyboard translation tables. The name of the system file is KEYBOARD.DCP, and it can be found in the C:\OS2 subdirectory by entering the PATH statement C:\OS2\BOOT\KEYBOARD.DCP. There is no default.

This statement is one of the interrelated CONFIG.SYS statements required for successful code-page switching. The other statements are: CODEPAGE and COUNTRY

The DEVINFO=KBD statement specifies your keyboard layout and a file named KEYBOARD.DCP that contains a keyboard layout table for translating keystrokes into the characters of each code page supported by the system.

To prepare a U.S. keyboard using the keyboard layout, US, type the following in the CONFIG.SYS file:

```
DEVINFO=KBD,US,C:\OS2\BOOT\KEYBOARD.DCP
```

Remember the following if you want to prepare an enhanced keyboard. All countries have at least one sub-country code supported by the OS/2. Several countries such as Italy, Russia, and the United Kingdom have two. Because these countries have more than one keyboard layout, the subcountry code allows you to select the keyboard you want. If you do not specify a subcountry code for these countries, DEVINFO uses the default subcountry codes: IT141 (for Italy), RU443 for Russia, and UK166 (for the United Kingdom).

To prepare the enhanced French keyboard, type the following in the CONFIG.SYS file:

```
DEVINFO=KBD,FR,C:\OS2\BOOT\KEYBOARD.DCP
```

F.7.72 DEVINFO=SCR,VGA,C:\OS2\BOOT\VIOTBL.DCP

Prepares a display for system code-page switching.

The syntax for the line is:

```
DEVINFO=SCR,Device,X:\path\filename
```

Where.

- `Device` specifies the reserved device name. The allowable device names are:

  ```
  CGA (IBM Color Graphics Adapter)
  EGA (IBM Enhanced Graphics Adapter)
  VGA (IBM Personal System/2 Video
  Graphics Adapter and IBM Personal
  System/2 8514/A)
  BGA (IBM Personal System/2 8514/A with
  memory expansion)
  ```

- `Drive, Path, and Filename` specifies the complete name of the file, which includes its extension, that contains the system code pages for the display. The name of the system file is VIOTBL.DCP, and it can be found in the C:\OS2 subdirectory by entering the PATH statement C:\OS2\BOOT\VIOTBL.DCP. There is no default.

This statement is one of the interrelated CONFIG.SYS statements required for successful code-page switching. The other statements are: CODEPAGE and COUNTRY

The display statement specifies your display name and a file named VIOTBL.DCP that contains a video font table for displaying characters in each of the code pages supported by the system.

To prepare a VGA display, type the following in the CONFIG.SYS file:

```
DEVINFO=SCR,VGA,C:\OS2\BOOT\VIOTBL.DCP
```

F.7.73 SET VIDEO_DEVICES=VIO_SVGA

Along with SET VIO_SVGA=DEVICE(BVHVGA, BVHSVGA) and DEVICE=C:\OS2\MDOS\VSVGA.SYS, this device driver provides support for an SVGA video card. VGA support is also supported.

F.7.74 SET DMIPATH=C:\DMISL\BIN

This is part of the SystemView Client for OS/2.

F.7.75 RUN=C:\OS2\SMSTART.EXE

SMSTART is a daemon that controls other system management daemons:

```
SMSTART --> FFST      (FFST daemon)
        \-> ERLOGGER  (Error logger)
        \-> DMISL     (DMI daemon)
        \-> REMOTERR  (Remote error, optional)
```

If any of these die, the SMSTART starts over.

F.7.76 SET IBMWORKS_INI=C:\BONUSPAK\IBMWORKS

This statement points to the IBM Works configuration file IBMWORKS.INI. IBM Works is part of the BonusPak.

F.7.77 DEVICE=C:\BONUSPAK\RS231B\ECRDRV.SYS

Along with DEVICE=C:\BONUSPAK\RS231B\RSMVDWO.SYS and CALL=C:\BONUSPAK\RS231B\PPS731B.EXE, these drivers provide support for Remote Support for OS/2. Remote Support for OS/2 is part of the BonusPak and allows IBM Support Centers to log onto your OS/2 Warp 4 workstation.

F.7.78 SET CLASSPATH=

The Java virtual machine uses CLASSPATH to find classes that are loaded as they are needed by the interpreter. The Java compiler uses CLASSPATH to find classes that you are compiling against (all the system classes) and their dependencies. In OS/2, the Java system classes are contained in the file x:\javaos2\lib\CLASSES.ZIP (it uses the zip file to get around long filename problems in the class files for FAT systems) and some of the runtime files are in the x:\javaos2\lib\JEMPCL10.ZIP. The JVM by default always look for bootdrive:\javaos2\lib\classes.zip and therefore this is not explicitly declared.

F.7.79 SET INCLUDE=

The Java compiler uses INCLUDE to find header (.H) files for use during compilation of .JAVA source files.

F.7.80 SET LIB=

The Java virtual machine and Java compiler use the LIB path to find dynamically linked libraries (.DLL) that are loaded as they are needed during compile and/or interpretation of Java code.

F.7.81 SET MMBASE=C:\MMOS2;

This sets an environment variable that indicates the path to OS/2's multimedia programs.

F.7.82 SET DSPPATH=C:\MMOS2\DSP;

This sets an environment variable used by various sound devices that support digital signal processors (DSPs). This is a *path* statement. It tells the device where to retrieve DSP modules. If you don't have a sound device that supports DSP, such as M-Audio adapter or the Sound Blaster 16 CSP, you can REM this line.

F.7.83 SET NCDEBUG=4000

In both Lotus 123 and Excel, users can record and play back audio and video annotations for specific cells. NCDEBUG is an environment variable required for this to work in Lotus 123. Excel does not need. If you do not have a need for this support, or do not have Lotus 123, you may REM this line.

F.7.84 RUN=C:\MMOS2\MIDIDMON.EXE

Along with DEVICE=C:\MMOS2\SSMDD.SYS, DEVICE=C:\MMOS2\R0STUB. SYS, DEVICE=C:\MMOS2\MIDI.SYS and DEVICE=C:\MMOS2\VCSHDD.SYS, this driver provides support for multimedia in OS/2 Warp 4.

F.7.85 NETWARE CLIENT FOR OS/2

The following sections discuss the NetWare Client for OS/2. Most of the NetWare Client is easily identifiable as it is surrounded by `REM --- NetWare Requester statements BEGIN ---` and `REM --- NetWare Requester statements END ---`. The rest of the client is located at F.7.54, "DEVICE=C:\NETWARE\VIPX.SYS" on page 1068 and F.7.55, "DEVICE=C:\NETWARE\VSHELL.SYS GLOBAL" on page 1069.

F.7.85.1 DEVICE=C:\NETWARE\LSL.SYS

This statement loads the link support layer driver. It is the lowest layer in the Novell Open Data Link Interface model and is required at all times for the requester to be active.

F.7.85.2 RUN=C:\NETWARE\DDAEMON.EXE

A daemon is a background process that usually carries out administrative tasks for the system without you knowing it. This *daemon* is required for the requester to be active.

F.7.85.3 DEVICE=C:\IBMCOM\PROTOCOL\ODI2NDI.OS2

This is the ODI2NDI protocol driver which allows the NetWare Client to use MPTS as the interface to a network adapter and in turn, the LAN.

F.7.85.4 rem DEVICE=C:\NETWARE\NTR2000.SYS

This is the standard NetWare Client adapter driver (or MLID driver). This is remmed out as the adapter driver used in OS/2 Warp 4's NetWare Client is in MPTS (which is made possible with the ODI2NDI.OS2 driver) and therefore the normal NetWare client adapter driver is redundant. This driver is surrounded by the statements `REM -- ODI-Driver Files BEGIN --` and `REM -- ODI-Driver Files END --`.

F.7.85.5 DEVICE=C:\NETWARE\ROUTE.SYS

This driver allows the NetWare Client to see NetWare servers on another physical LAN (or segment) across *source-routing* routers (used by many IBM routers). Equivalent to ROUTE.COM for a DOS/WINDOWS NetWare Client and ROUTE.NLM for a NetWare server.

F.7.85.6 DEVICE=C:\NETWARE\IPX.SYS

This statement provides Novell IPX protocol support and is required for access to a NetWare server.

F.7.85.7 DEVICE=C:\NETWARE\SPX.SYS

This statement provides Novell SPX protocol support.

F.7.85.8 RUN=C:\NETWARE\SPDAEMON.EXE

This statement loads a daemon process that handles SPX packets.

F.7.85.9 DEVICE=C:\NETWARE\NMPIPE.SYS

This driver provides Named Pipes support on the client.

F.7.85.10 DEVICE=C:\NETWARE\NPSERVER.SYS

This driver allows your workstation to function as a Named Pipes server.

F.7.85.11 RUN=C:\NETWARE\NPDAEMON.EXE NP_COMPUTERNAME

This statement provides Named Pipes NetBIOS support.

F.7.85.12 DEVICE=C:\NETWARE\NWREQ.SYS

The is the main NetWare requester module and must follow IPX, SPX and Named Pipes.

F.7.85.13 IFS=C:\NETWARE\NWIFS.IFS

This is the NetWare Installable File System and allows OS/2 Warp 4 to see the NetWare network drives like it sees the local drives.

F.7.85.14 RUN=C:\NETWARE\NWDAEMON.EXE

This daemon provides IPX packet exchange.

F.7.85.15 DEVICE=C:\NETWARE\NETBIOS.SYS

This statement provides NetBIOS support in the NetWare Client.

F.7.85.16 RUN=C:\NETWARE\NBDAEMON.EXE

This statement loads the NetWare NetBIOS daemon.

F.7.85.17 DEVICE=C:\OS2\MDOS\LPTDD.SYS

This allows a DOS session to print to an LPT port that has been redirected (or *captured*) to a network printer.

F.7.86 Multi-Protocol Transport Services (MPTS)

The following sections discuss MPTS (also see F.7.21, "DEVICE=C:\IBMCOM\PROTOCOL\LANPDD.OS2" on page 1054 and F.7.22, "DEVICE=C:\IBMCOM\PROTOCOL\LANVDD.OS2" on page 1054 for DOS and WIN-OS/2 components of MPTS).

F.7.86.1 DEVICE=C:\ibmcom\LANMSGDD.OS2 /I:C:\IBMCOM /S

This tells OS/2 where to put MPTS's error log, LANTRAN.LOG. The LANTRAN.LOG file is written to the subdirectory that is specified by the /I parameter. In this case, the C:\IBMCOM directory (which is also the default). If no /I is present, the LANTRAN.LOG file is written to the root directory of the starting drive. Other options:

- `/P` disables the pause-on-error function during initialization. The user is not prompted with `Press any key to continue` following an error message.
- `/S` turns off the message display option. Messages are not displayed on the screen, but they are still logged.

Note: MPTS defaults the /S option, turning off the message display option. To remove this option, edit the CONFIG.SYS file and remove the /S parameter from the LANMSGDD.OS2 device statement.

F.7.86.2 DEVICE=C:\IBMCOM\PROTMAN.OS2 /I:C:\IBMCOM

This is the NDIS Protocol Manager in MPTS. This file reads the PROTOCOL.INI configuration file and as the CONFIG.SYS is loaded, it maintains a list of active NDIS drivers and their desired bindings. This is the first MPTS driver in the CONFIG.SYS. see F.1, "Sample OS/2 Warp 4 CONFIG.SYS" on page 1043 for its location.

F.7.86.3 CALL=C:\IBMCOM\PROTOCOL\NETBIND.EXE

This driver binds the protocols to the adapter driver that the NDIS Protocol Manager (PROTMAN.OS2) tells it to.

F.7.86.4 RUN=C:\IBMCOM\LANMSGEX.EXE

This is part of the messaging system in MPTS.

F.7.86.5 DEVICE=C:\MPTN\PROTOCOL\SOCKETS.SYS

This statement provides the Common Transport Semantics (CTS) support in MPTN's TCP/IP protocol stack.

F.7.86.6 DEVICE=C:\MPTN\PROTOCOL\AFOS2.SYS

This is part of the MPTN's TCP/IP protocol stack.

F.7.86.7 DEVICE=C:\MPTN\PROTOCOL\AFINET.SYS

This is the TCP/IP Service Driver for the MPTN's TCP/IP protocol stack.

F.7.86.8 DEVICE=C:\MPTN\PROTOCOL\IFNDIS.SYS

This statement provides the IP NDIS interface in MPTN's TCP/IP Protocol stack.

F.7.86.9 RUN=C:\MPTN\BIN\CNTRL.EXE

This is part of MPTN's TCP/IP protocol stack.

F.7.86.10 CALL=C:\OS2\CMD.EXE /Q /C C:\MPTN\BIN\MPTSTART.CMD >NUL

This starts the TCP/IP configuration files.

F.7.86.11 DEVICE=C:\IBMCOM\PROTOCOL\NETBEUI.OS2

This is the NetBIOS protocol driver.

F.7.86.12 DEVICE=C:\IBMCOM\PROTOCOL\TCPBEUI.OS2

This is the TCPBEUI (NetBIOS over TCP/IP) protocol driver.

F.7.86.13 DEVICE=C:\IBMLAN\NETPROG\RDRHELP.200

RDRHELP.200 does the following:

1. Reserves COM 1-9 (if not already claimed)
2. Reserves LPT 1-9 (if not already claimed)
3. Necessary for NB30 NetBIOS function

F.7.86.14 IFS=C:\IBMLAN\NETPROG\NETWKSTA.200 /I:C:\IBMLAN /N

This is the LAN Redirector. This installable file system allows File and Print Network drives to be seen as local drives.

F.7.86.15 DEVICE=C:\IBMCOM\PROTOCOL\NETBIOS.OS2

This is the NetBIOS API driver.

F.7.86.16 SET ETC=C:\MPTN\ETC

This is an environment variable that makes the TCP/IP files (for example INI files) available to the TCP/IP applications.

F.7.86.17 DEVICE=C:\IBMCOM\MACS\IBMTOK.OS2

This is the Network adapter driver. In this case, it is the IBM Token-ring card.

F.7.86.18 SET NLSPATH=

This variable is involved in the location of message files as part of NLS support.

F.7.87 SET I18NDIR=C:\IBMI18N

This is an environment variable for the IBM I18N Toolkit.

F.7.88 SET NETVIEW_PATH=C:\SVCA

Along with **SET SVA_PATH=C:\SVCA** and **SET SNMPDIR=C:\SVCA\ETC**, these are CONFIG.SYS statements for SystemView Client for OS/2.

F.7.89 IFS=C:\MFS\DLL\MCM.IFS

This is the Installable File System for Mobile File Synchronization (MFS).

F.7.90 SET MFSCACHE=C:\MFS\CACHE\

This is where Mobile File Synchronization (MFS) stores the cached files.

F.7.91 SET HOARDPATH=C:\MFS\BIN\HP

This is part of Mobile File Synchronization (MFS).

F.7.92 FILE AND PRINT CLIENT

The following lines are for the File and Print Client:

```
RUN=C:\IBMLAN\NETPROG\LSDAEMON.EXE
DEVICE=C:\IBMLAN\NETPROG\VNETAPI.OS2
RUN=C:\IBMLAN\NETPROG\VNRMINIT.EXE
SET NWDBPATH=C:\IBMLAN\NETPROG
SET DLSINI=C:\IBMLAN\NETPROG\NETGUI.INI
SET INIT_FILE_NAMES=netgui
SET INIT_FILE_RANGES=200
SET WPS_COMMUNICATION=YES
```

F.7.93 SET LANINSTEP=Z:\CID\IMG\ibmpeer

This is part of the remote install (CID) setup.

F.7.94 TCP/IP for OS/2

The following lines are for TCP/IP for OS/2:

```
SET TMP=c:\tcpip\tmp
DEVICE=c:\tcpip\bin\vdostcp.vdd
DEVICE=c:\tcpip\bin\vdostcp.sys
RUN=c:\tcpip\bin\VDOSCTL.EXE
```

F.7.95 DEVICE=C:\OS2\LOG.SYS

To set the size of the System Error Logging Service error-log buffer to 32 KB, type the following in the CONFIG.SYS file:

```
DEVICE=C:\OS2\LOG.SYS /E:32
```

To set the size of the System Error Logging Service error-log device driver entry alert notification buffer to 64 KB, type the following in the CONFIG.SYS file:

```
DEVICE=C:\OS2\LOG.SYS /A:64
```

To pause error logging, type the following in the CONFIG.SYS file:

```
DEVICE=C:\OS2\LOG.SYS /OFF
```

F.7.96 RUN=C:\OS2\EPW.EXE

This is the generic alerter, where the operating system detects errors and can send messages to other machines.

F.7.97 RUN=C:\OS2\SYSTEM\LOGDAEM.EXE

To specify C:\OS2\SYSTEM as the path for the error-log file, LOG0001.DAT, type the following in the CONFIG.SYS file:

```
RUN=C:\OS2\SYSTEM\LOGDAEM.EXE /E:C:\OS2\SYSTEM\LOG0001.DAT
```

To set the size of the error-log file, LOG0001.DAT, with the path C:\OS2\SYSTEM to 32 KB, type the following in the CONFIG.SYS file:

```
RUN=C:\OS2\SYSTEM\LOGDAEM.EXE
/E:C:\OS2\SYSTEM\LOG0001.DAT /W:32
```

F.7.98 DEVICE=C:\NETFIN\SYSINFO.SYS

This is the device driver needed to provide data for the system information tool.

F.7.99 SUPPRESSPOPUPS=C

Use SUPPRESSPOPUPS to suppress the pop-up box display of trap information messages and logs the trap information to the file POPUPLOG.OS2 in the root directory of the drive specified by C.

F.7.100 REIPL=ON

This command automatically restarts the system when a system trap or internal processing error occurs. Parameter is ON or OFF. Default is OFF.

F.7.101 TRAPDUMP=ON

Indicates when a stand alone memory dump is to be taken and where the dump is to be placed. The default value is OFF and the default drive is A:.

Parameters are:

```
OFF,drive letter
ON,drive letter
RO,drive letter
```

A memory dump is a dump of what is located in physical memory (that is, RAM). When you have problems such as TRAPS or Internal Processing Errors, taking a memory can assist IBM in debugging the problem.

If you are sending a memory dump to hard disk (for example TRAPDUMP=ON,C:), you must first create a FAT partition labelled SADUMP and give it a size greater than the amount of physical memory in your system. The drive you specify in the TRAPDUMP statement must contain the SADUMP partition. Any existing data in this partition will be overwritten. The system will restart after the TRAPDUMP process has been completed.

F.7.102 TIMESLICE=128,256

This command allows you to manually control the minimum and maximum amount of processor time any thread can receive at once. The syntax is TIMESLICE=X,Y where X is the minimum time slice (in milliseconds and must be at least 32) and where Y is the maximum length (must be less than 65536).

F.7.103 VME=NO

This will turn off the Virtual Mode Extension feature of Pentium and later 486 processors. If you experience problems with some DOS and Windows applications, try putting this in the CONFIG.SYS and see if they are resolved.

F.7.104 BASEDEV=RESERVE.SYS

RESERVE.SYS is an optional device driver used to reserve hardware resources for specific device drivers. This is particularly useful for device drivers that are not Resource-Manager-aware. To determine if the device driver you want to install is Resource-Manager-aware, run RMVIEW.EXE.

There are number of configuration parameters for RESERVE.SYS. Type `help reserve.sys` in an OS/2 Window to find details on these.

Before using RESERVE.SYS, you must know what resources the device driver uses so that you specify the correct parameters on the BASEDEV=RESERVE.SYS statement in your CONFIG.SYS file.

RESERVE.SYS can be used in one of the following two ways:

1. To reserve the resources used by a device driver that are not Resource-Manager-aware.
2. If you have a piece of hardware that does not allow its resources to be examined, you can reserve those resources so that they are not examined by the Resource Manager.

F.7.105 BASEDEV=OS2SCSI.DMD

The device manager transport layer for device drivers written to the OS/2 SCSI Device Driver Specification. OS2SCSI provides a hardware independent interface to device drivers written to the IBM OS/2 SCSI Device Driver Specification. This device driver has no parameters.

OS2SCSI.DMD is a replacement driver for OS/2 SCSI.SYS and should be installed instead of SCSI.SYS.

Examples of device drivers requiring this support are: IBM OPTICAL.SYS, IBM 2546 Scanner and SYTRON tape device drivers.

F.7.106 DEVICE=BASEDEV=OS2CDROM.DMD

This statement provides support for CD-ROM drives. The syntax for the line is:

```
DEVICE= OS2CDROM.DMD /V /Q
```

Where:

- `/V` specifies the verbose mode. This parameter displays the product identification and firmware level of the CD-ROM drive during OS/2 initialization.
- `/Q` specifies a quiet fail. This parameter inhibits the display of an error message if OS2CDROM.DMD fails to load during OS/2 initialization. /Q is useful for users who occasionally start the OS/2 operating system with the CD-ROM drive turned off.

F.7.107 BASEDEV=OS2ASPI.DMD

This is the device manager transport layer for device drivers written to Adaptec's ASPI (Advanced SCSI Programming Interface). OS2ASPI provides a hardware-independent interface to device drivers written to Adaptec's ASPI specification. OS2ASPI is a replacement for Adaptec's ASPI4OS2.SYS. OS2ASPI should be installed instead of ASPI4OS2.SYS.

The syntax for the line is:

```
BASEDEV=OS2ASPI.DMD /SHARE /ALL
```

Where:

- /SHARE: this switch instructs OS2ASPI.DMD to release each target after each command, allowing multiple managers to access a target at different times. Since this requires more commands to be issued to the driver, there will be a small performance penalty when this switch is used.

  When sharing devices and sending multiple concurrent requests, it is possible that the allocation and or deallocation of the device will cause a command to be rejected. This switch is best suited for use when you have applications that require different managers but will not be used simultaneously.

- /ALL: this switch instructs OS2ASPI.DMD to allow commands to be issued to any device on the SCSI bus, even those allocated by other managers. Commands should be issued to devices under the control of other managers with extreme caution. If you are using the /ALL switch and plan to issue commands to devices that are shared with another manager, try and limit them to non-destructive commands, such as Inquiry and Test Unit Ready.

OS/2 requires a device to be allocated by a device manager, such as OS2ASPI.DMD or OS2DASD.DMD, before it can be accessed. Device managers can handle this in one of two ways: wait for a device driver to issue an allocation request (OS2SCSI.DMD does this) or permanently allocate the device during system boot (OS2DASD.DMD and OS2CDROM.DMD do this).

The ASPI specification has no concept of device allocation and this leaves it up to the implementation to decide what to do. OS2ASPI will not allocate a device until the first execute I/O command is issued. This allows it to scan for devices and not interfere with them until an application decides to issue a command. However, once this allocation takes place OS2ASPI will not release the device because it can never be sure when the application is finished with it.

F.7.108 PCMCIA Drivers

PCMCIA stands for Personal Computer Memory Card International Association. PCMCIA is a bus architecture that is used to allow PCMCIA devices to slide into a PCMCIA slot. This architecture is mainly implemented on laptop machines. The devices that may be used in the slots are token-ring cards, Ethernet cards, modem cards, 3270 emulation cards, ATA cards (small hard drives), FLASH cards, and SRAM cards.

PCMCIA Support in OS/2 Warp 4 has:

- PCMCIA Card Services
- PCMCIA Socket Services

- PCMCIA Modem Support
- PCMCIA ATA Support
- PCMCIA FLASH Support

The following files must be in this order in the CONFIG.SYS file.

1. Card Services

   ```
   BASEDEV=PCMCIA.SYS
   ```

2. Socket Services - One of the following depending on the system:

   ```
   BASEDEV = IBM2AMB1.SYS - Ambra
   IBM2AST1.SYS - AST
   IBM2CMQ1.SYS - Compaq
   IBM2CAD1.SYS - CompuAdd
   IBM2MAT1.SYS - Panasonic
   IBM2NEC.SYS  - NEC
   IBM2NCR.SYS  - NCR
   IBM2TOS.SYS  - Toshiba
   IBM2ZEN.SYS  - Zenith 2 Lite
   IBM2ZOS.SYS  - ZEOS
   IBM2SSO1.SYS - ThinkPad 7XX (ISA Bus)
   IBM2SSO2.SYS - ThinkPad 720
   ```

3. Modem Driver

   ```
   DEVICE=C:\OS2\AUTODRV2.SYS C:\OS2\AUTODRV2.INI
   ```

4. ATA Driver

   ```
   BASEDEV=PCM2ATA.ADD
   ```

5. FLASH Drivers

   ```
   DEVICE=C:\OS2\ICMEMMTD.SYS,
   DEVICE=C:\OS2\ICMEMCDD.SYS 2, S
   ```

Note on PCMCIA Drivers

Do not have more than one set of PCMCIA drivers on your machine. If your machine, such as an IBM ThinkPad, comes with its own PCMCIA drivers (that is, Card & Socket Services), use those in preference to the ones in OS/2 Warp 4.

F.7.108.1 Card Services

One of the three main software components in the PCMCIA architecture, Card Services provides an industry-standard interface layer between the client device driver and the hardware-specific Socket Services.

F.7.108.2 Socket Services

One of the three main software components in the PCMCIA architecture, Socket Services provides an industry-standard interface layer across hardware platforms for a specific chip-set support.

Socket Services options are as follows:

Option	Description
/E or /e	Enable copyright
/Sn=x	x sets the number of sockets on adapter n. The adapter number can be 0 or 1.
/Cn=x	x sets the Interrupt Level for Status Change on adapter n. The adapter number can be 0 or 1.
/N:IRQ0	No-Check IRQ-0 Value at SetAdapter/SetSocket Functions.
/IRQH	
/IRQL	Select IRQ trigger level. (AT-Bus systems are set to be IRQ-High as the default)
/APOFF	Set Auto-Power Mode to off. Auto-Power Mode provides the PC-Card power automatically On/Off by hardware. Default:Auto-Power Mode is off.
/PH	Change the return code from BAD SOCKET to BUSY when the client accesses the specified socket (which is for Boot-Socket or Not-Accessible Socket).
/IOn=xxxx	xxxx specifies the socket number list of adapter. The adapter number can be 0 or 1. /IO0=12 :Socket 1 and 2 are changed on Adapter 0. /IO0=21 :Same as /IO0=12. /IO1=124 :Socket 1, 2, and 4 are changed on Adapter 1. Change the IOCS16 control-line connection from the PC Card itself to the PC Card controller chip. This option is needed for some cards that do not generate an IOCS16 signal.
/MEMn=xxxx	xxxx specifies the socket number list of adapter n. The adapter number can be 0 or 1. /MEM0=12 :Socket 1 and 2 are changed on Adapter 0. /MEM0=21 :Same as /MEM0=12. /MEM1=124 :Socket 1, 2, and 4 are changed on Adapter 1. Change the MEMCS16-Line generated from A23-A12 toA23-A17.

/RIn=xxxx xxxx specifies the socket number list of adapter n.

The adapter number can be 0 or 1.
/RI0=12 :Socket 1 and 2 are changed on Adapter 0.
/RI0=21 :Same as /RI0=12.
/RI1=124 :Socket 1, 2, and 4 are changed on Adapter 1.

Change the RI-Signal (Ring Indicator) from the I/O card to be mapped STSCHG Line in the system. (For ExCA V1.50 Requirement)

/IGn=xxxx xxxx specifies the socket number list of adapter n.

The adapter number can be 0 or 1.
/IG0=12 :Socket 1 and 2 are changed on Adapter 0.
/IG0=21 :Same as /IG0=12.
/IG1=124 :Socket 1, 2, and 4 are changed on Adapter 1.

Ignore the specified socket. With this option, Socket Services does not access the physical socket. This option is for some point-enabler software, but point-enabler software is not guaranteed to work perfectly under running the socket services.

/NCn=xxxx xxxx specifies the socket number List of adapter n.

The adapter number can be 0 or 1.
/NC0=12 :Socket 1 and 2 are changed on Adapter 0.
/NC0=21 :Same as /NC0=12.
/NC1=124 :Socket 1, 2, and 4 are changed on Adapter 1.

Treat the specified socket on the adapter as though it is not connected in the system.

/DEBUG Display PC-Card controller information.

/G for PS/2 E System

/H for PS/2 55 System

/TP710T for ThinkPad 710T System

/TP730T for ThinkPad 730T System

Set the Socket-Services environment for the specified system. These options are available for IBMDSS01.SYS and IBM2SS01.SYS.

F.7.109 SET RESTARTOBJECTS

This statement modifies the default behavior of the Workplace Shell.

F.7.110 AUTOFAIL

This is a utility program that displays system error information.

F.7.111 SET PAUSEONERROR

If set to NO, it will prevent the system from pausing before starting the user interface or command processor during the processing of the CONFIG.SYS file.

F.7.112 Sound Blaster AWE32 and Sound Blaster 16 Plug and Play Drivers

These drivers include support for Plug and Play cards. The drivers will detect these cards and automatically initialize them.

To enable automatic configuration of Plug and Play cards, omit all hardware related parameters in the CONFIG.SYS DEVICE= line. These are /A, /I, /M, /D and /H for base address, IRQ, MPU port address, 8-bit DMA and 16-bit DMA respectively.

If any of these parameters are specified, the driver will initialize the hardware with the parameter value specified taking default values for the parameters omitted.

F.7.112.1 Plug and Play BIOS

On systems with Plug and Play BIOS, the driver will not initialize the hardware unless otherwise requested. The BIOS initializes the sound board and the driver just reads the settings.

But again, if any of the hardware parameters are specified in the DEVICE= line, the driver will initialize the card with the specified parameters. This feature comes in handy when having to configure a system with Plug and Play BIOS and with legacy cards that cannot be configured. Such legacy cards might have resource conflicts with standard Sound Blaster configuration. In this case you can ask the driver to override the default configuration with the one you specified in CONFIG.SYS.

On some systems, the driver's Plug and Play BIOS interface in the driver causes it to crash during initialization. This is due to incompatibility between different Plug and Play BIOS implementations. If you get the problem, try the /P option with the driver. This tells the driver to ignore the Plug and Play BIOS forcing it not to access the Plug and Play BIOS functions even if one is present.

F.7.112.2 Co-existence Other Plug and Play Cards

The SB driver will initialize *only* Sound Blaster Plug and Play cards. If there are other Plug and Play cards in the system, the driver will not initialize them. Nor will it tamper with other Plug and Play cards that have already been initialized by its driver or Plug and Play BIOS. This ensures a certain level of system integrity.

F.7.112.3 CONFIG.SYS DEVICE= Line Syntax

The new drivers use a different command line syntax from the original Sound Blaster drivers installed with Warp MMPM/2. The new DEVICE= line syntax goes like this:

```
DEVICE=<path>\SB16D2.SYS /C:n /D:n /H:n /I:x
/A:xxx /B:n /M:xxx  [/Q] [/EXT]
```

Where:

/C: Card Number; set to 1 in most cases

/D: 8-bit DMA channel

Valid values 0, 1 & 3 (Sound Blaster cards that use Vibra chipset do not have 0). Default value 1.

/H: 16-bit DMA channel

Valid values 5, 6 & 7 (Sound Blaster cards that use Vibra chipset do not have 6). Default value 5.

/I: IRQ number

Valid values 5, 7, 9, 10 & 11. Default IRQ 5.

/A: Base address

Valid values 220, 240, 260, 280 Default value 220.

/B: Buffer size in KB

Valid values 1-24. While any value in this range will work fine, to get the best results don't use this option and let the driver use the default buffer size. Default value 8 KB.

/M: MPU port address

Valid values 300 and 330 Default value 330.

/N: Driver name, set this to SBAUD1$

/Q Quiet mode flag, OPTIONAL

Setting this option disables initialization messages. If not specified the initialization messages are displayed during boot-up.

/EXT Use MPU port instead of internal synth for MIDI, OPTIONAL By default the drivers are configured to use the internal synthesizer. But if you have a daughterboard attached to your Sound Blaster card and you want MIDI playback to use the synthesizer in the daughterboard, specify this flag.

/P Ignore Plug and Play BIOS if it is present. If Plug and Play BIOS is present, the driver usually queries the BIOS for certain Plug and Play port addresses. Specifying this option causes the driver not to access the BIOS and determine these port addresses itself.

The new driver does not recognize the old positional syntax.

The installation program will make the necessary chages to your CONFIG.SYS. But make sure that you have a valid existing Sound Blaster AWE32 or Sound Blaster 16 support installed in MMPM/2.

A sample CONFIG.SYS statement looks like this:

```
DEVICE=C:\SBAWE32\SBAWED2.SYS /C:1 /D:1 /H:5 /I:5 /A:220 /B:8 /M:330
/N:SBAUD1$ /Q
```

F.7.113 LASTDRIVE=Z

Set the letter of the lastdrive to Z.

Appendix G. OS/2 Warp 4 Certification Test Objectives and Study References

This appendix lists the objectives covered by each OS/2 Warp 4 certification test. Also provided as study references for each objective are page references to sections in this Handbook. For some objectives, references are also made to OS/2 Warp 4 On-line Documentation or Help. Use this appendix as a guide to your certification test study and preparation.

G.1 Objectives for Test 200, "OS/2 Warp 4 Fundamentals"

G.1.1 Section 1: Planning and Installation

1. Given a set of requirements to configure a sound card for OS/2 Warp 4, describe the procedure and resources used to successfully configure a sound card to ensure it produces sound.
   - 2.6.2, "Installing and Configuring Audio Cards" on page 58
2. Given a PCMCIA card, describe the steps to install and configure "Plug and Play" support and how to verify that the configuration is successful.
   - 2.6.3, "Installing and Configuring PC Cards" on page 61
3. List the hardware prerequisites to install OS/2 Warp 4 so that the system meets a customer's feature and function requirements.
   - 2.1.1, "Memory and Disk Space Requirements" on page 15
   - 2.10.1, "General Setup Considerations" on page 118
   - Appendix A, "OS/2 Warp 4 Hardware Requirements" on page 963
4. Given an existing configuration and a set of requirements, explain the steps required to install OS/2 Warp 4 with or without retaining the existing configuration, and explain the advantages and disadvantages of keeping or deleting the existing configuration.
   - 2.2.2.1, "Planning Your Migration from DOS/Windows 3.x" on page 25
5. Given a set of requirements, select the features of OS/2 Warp 4 to be installed to support the environment.
   - 2.5, "Advanced Installation" on page 44
6. Describe the video driver installation steps for a specified supported video driver.
   - 2.6.1, "Installing and Configuring Video Adapters" on page 56
   - Appendix C, "OS/2 Device Driver Pak CD" on page 987
7. List the methods to find and the steps to install the device drivers necessary for a given device.

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- Appendix C, "OS/2 Device Driver Pak CD" on page 987

8. Given a set of requirements, describe the steps to plan and configure an empty physical drive so that OS/2 Warp 4 can be installed, with or without another operating system on the same drive.
   - 2.1.2, "Partitioning and Formatting Your Hard Disk" on page 15
9. Explain the migration process for installed applications.
   - 2.2.2.1, "Planning Your Migration from DOS/Windows 3.x" on page 25
10. Given a list of customer applications, select the proper file system(s) and plan for required application support and efficient use of disk space.
    - 2.1.2.2, "Logical Partitions - Primary and Extended" on page 16
    - 2.1.2.3, "FAT or HPFS?" on page 18
    - 2.10.2, "File Systems" on page 119
11. Given a set of requirements, determine the optimal installation method and describe the steps used to install OS/2 Warp 4 using the chosen install method.
    - Chapter 2, "Planning and Installing OS/2 Warp 4" on page 15
12. Given a requirement for a multiple OS environment, select an installation plan to allow booting of all installed operating systems.
    - 2.1.2.6, "The Boot Manager" on page 22

G.1.2 Section 2: Customization and Usage

1. Identify the steps to create program objects using the Add Programs object.
   - 3.4.2, "Program Object" on page 191
2. Given an OS/2 Warp 4 supported DOS, Windows, or OS/2 application, describe the steps to install, migrate, configure settings, and optimize the application within the Workplace Shell. Describe the impact on performance and usability upon the application.
   - 2.2.2.1, "Planning Your Migration from DOS/Windows 3.x" on page 25
   - 2.5, "Advanced Installation" on page 44
   - 2.10, "Tuning for Performance" on page 117
3. Given a set of configuration requirements for the toolbar, modify the toolbar to function as specified by the requirements with no errors.
   - 3.2.2, "Tool Bar" on page 168
4. Given a set of user requirements, describe how to use the options in the desktop Properties to configure the OS/2 Warp 4 desktop as specified by the user and explain the impact of modifying each of the options.
   - 3.6, "Desktop Properties Folder" on page 210
5. Explain the additional parameters which need to be entered in a program reference object if the program is not in the Migration Database.

- 2.8.3.1, "How Does It Work?" on page 74

6. Explain how to create a program reference object for an installed program.
   - 3.4.2, "Program Object" on page 191
7. Describe the features of the Warp Center and explain how to use and configure them.
   - 3.2, "WarpCenter and the Tool Bar" on page 159
8. Describe the procedure for creating and configuring a working, local printer object on the desktop of an installed OS/2 system.
   - 4.3, "Printer Drivers and Objects" on page 235
9. Describe the steps to remove an installed component from an OS/2 Warp 4 system and explain how to ensure that it has been removed.
   - 2.7, "Selective Uninstall" on page 63
10. Describe how to install a new font into an existing OS/2 Warp 4 system.
    - 2.8.2, "Installing OS/2 Warp 4 Fonts" on page 69

G.1.3 Section 4: Problem Determination

1. Explain how to activate the Recovery Choices Menu and the circumstances in which it would be used. Given a set of circumstances, describe which choice would be selected and what the results would be.
   - Chapter 10, "Recovery" on page 773
2. Explain the OS/2 boot process and the hardware configuration dependencies.
   - 2.1.2.6, "The Boot Manager" on page 22
3. List the circumstances in which the Workplace Shell .INI files must be rebuilt.
   - Chapter 10, "Recovery" on page 773
   - 10.2.2, "System Recovery Options" on page 778
4. Identify the steps required to rebuild the Workplace Shell .INI files.
   - Chapter 10, "Recovery" on page 773
   - 10.2.2, "System Recovery Options" on page 778
   - 10.2.2.1, "Booting to a Command Line - F2" on page 779
5. Given a problem determination scenario, identify and list the documentation (both on and off line) and other resources used to facilitate the resolution of the problem.
   - Chapter 11, "Help Functions and Support Tools" on page 797
6. List the steps and software components needed to create an automated system for installing OS/2 Warp 4 using the CID process.
   - 2.9, "Configuration, Installation, and Distribution (CID)" on page 74

G.2 Objectives for Test 201, "OS/2 Warp 4 Connectivity"

G.2.1 Section 1: TCP/IP - Internet

1. List the steps to configure the OS/2 Warp Client to use DHCP, and explain how to perform a successful configuration.
   - 5.1.2, "Easy Installation" on page 264
   - 5.1.3, "Advanced Installation" on page 283
2. Explain how INETD and TCP/IP Daemon configuration parameters can affect the use of system resources.
   - 5.10.9, "The INETD Super Server Daemon" on page 579
   - 5.10.7, "The TCP/IP Configuration Notebook" on page 557
3. Describe the steps to test a successful FTP host session.
   - 5.10.12, "Transferring Files with FTP" on page 593
4. List and describe the steps necessary to create, configure, and test an FTP host session using the OS/2 Warp 4 FTP host folder so that seamless access to an FTP host is achieved.
   - 5.10.13, "Setting Up an FTP Server" on page 603
5. Given the requirement to configure for other Internet providers, successfully configure for access to another provider's services.
   - 5.3.6, "Accessing Other Network Environments" on page 351
   - 5.10.10.2, "Using Another ISP" on page 582
6. Identify and list the steps to configure TCP/IP Services to meet customer requirements using the TCP/IP configuration tool. (FTP, TELNET, LPD, INETD).
   - 5.1.2, "Easy Installation" on page 264
7. Given a specific environment, describe the steps to configure the required fields and values necessary to enable communications in a TCP/IP environment.
   - 5.10, "TCP/IP Support in OS/2 Warp 4" on page 537

G.2.2 Section 2: Network Operating System Connectivity

1. Given the requirement to configure access to a Network Operating System (NOS), describe the criteria to select the required network support and describe the steps to configure the selected support. Describe the steps to test for successful network access to the NOS.
   - 5.3, "Accessing IBM Warp Server and Microsoft Windows NT Server" on page 342
   - 5.4, "Accessing Novell NetWare Servers" on page 355

2. List the steps to create and configure a network printer object for both File and Print services in LAN Server and non-LAN Server queues, and verify that it functions correctly.
   - 4.3, "Printer Drivers and Objects" on page 235
   - 5.2.2, "Network Printers" on page 310
   - On-line Help
3. Given a set of communications specifications, configure the OS/2 Warp 4 transport for proper operation.
   - 5.8, "Multiple Protocol Transport Services" on page 443
4. Describe the uses for each of the networking transport protocols supported by OS/2 Warp 4.
   - 5.1, "Installing OS/2 Warp 4 Network Components" on page 262
5. Explain how to use MPTS to configure an adapter for which no drivers are provided.
   - 5.8.1.2, "Installing a Non-Supported Protocol" on page 446
6. Given a set of networking requirements, describe the procedure, configurable values, and the consequences of installing, configuring, and tuning OS/2 Warp 4 network components.
   - 5.1, "Installing OS/2 Warp 4 Network Components" on page 262

G.2.3 Section 3: Remote Access and Host Connectivity

1. Describe the configuration parameters for the Remote Access Client so that you can connect and logon to a remote access system.
   - 5.9.5, "Configuring User IDs and Security" on page 487
   - 5.9.6, "Further Configuration through the Settings Notebook" on page 507
2. Describe the steps required to install and configure the Remote Access Client so that a connection can be made successfully to a Remote Access Connection Server.
   - 5.9.4, "Installing the Remote Access Client" on page 487
3. Explain how the security features of the Remote Access Client affect the user's access and usage options.
   - 5.9.5, "Configuring User IDs and Security" on page 487
4. Explain how to configure OS/2 Warp 4 for single logon and password changes to a variety of systems.
   - 5.2.10, "Coordinating Passwords on Different Servers" on page 329
   - 5.2.10.2, "Configuring Network SignON Coordinator for LAN-Based Systems" on page 330
   - 5.2.10.3, "Configuring Network SignON Coordinator for Host-Based Systems" on page 334

5. List and describe the steps to create and configure a host connection session so that standard 3270 and 5250 host data is presented to the user. Describe the steps to test for a successful host connection session.

   - 5.11.2, "Configuring the Personal Communications Entry Level Connection" on page 675

6. Given a customer requirement to install and configure the OS/2 Warp 4 Lotus Notes Mail Client, describe the steps to install the client, list the necessary configuration parameters to setup the Lotus Notes Mail Client, and then verify the client works correctly.

   - 1.5.1, "Lotus Notes Mail" on page 7
   - On-line Help

G.2.4 Section 4: Remote Installation

1. Given a set of user requirements, describe the steps to prepare the source and target machines for remote installation using the OS/2 Warp 4 Remote Install Utility for both a panel and a response file installation. Describe the steps to perform an OS/2 remote installation and configuration of OS/2 Warp 4.

   - 5.1.4, "Installing Remotely on the LAN" on page 303

G.3 Objectives for Test 202, "OS/2 Warp 4 Advanced Concepts and Support"

G.3.1 Section 1: Speech and Multimedia

1. Describe how to move the Voice Type Dictation environment for a user to another system so that the user obtains the same level of accuracy experienced in the existing Voice Type Dictation environment.
   - 7.6.2.3, "How to Move Your Enrollment to Another System" on page 722
   - 7.11, "Trouble Shooting Your Speech Environment" on page 732
2. Describe the settings in Voice Type Dictation that can affect speech recognition accuracy.
   - 7.6.2, "VoiceType Enrollment" on page 715
3. List the steps required to enable an object to be accessed using the "jump-to" voice command.
   - 7.10, "Customizing Speech for Your Desktop" on page 729
4. Describe the conditions under which enrollment training might be needed to improve speed recognition.
   - 7.6.2, "VoiceType Enrollment" on page 715
5. Given an OS/2 Warp 4 system with speech enabled, describe how to customize the voice commands for an application.
   - 7.10, "Customizing Speech for Your Desktop" on page 729
   - 7.10.1, "The Battery-Indicator Example" on page 730
6. Describe the technique a Voice Type Dictation user might need to improve speech recognition accuracy.
   - 7.6.2, "VoiceType Enrollment" on page 715
   - 7.6.2.1, "Preparing for the Enrollment" on page 718
   - 7.6.2.4, "Problems with Enrollment Processing" on page 722
7. Describe in sequence the tasks required to install audio adapter support. This includes audio and modem support.
   - 2.8.1, "Installing and Configuring Mwave" on page 65

G.3.2 Section 2: Problem Determination and Support Services

1. Describe the structure of the MAKEINI.EXE command when used in resetting the Workplace Shell "lock system" password.
   - 10.5.4, "MAKEINI Command" on page 795
2. Given non-functioning hardware, resolve IRQ conflicts to produce a successful boot with operational hardware.

- 2.11.1.3, "The Hardware Manager" on page 133

3. Describe the conditions under which modifying the "Recovery Choices" menu becomes necessary.
   - 10.3, "Customizing Your Archives" on page 781
4. List the steps required to modify the system such that the "Recovery Choices" menu provides additional configuration options during startup.
   - 10.3, "Customizing Your Archives" on page 781
5. Given the need to contact IBM Support Services, list the specific information which will need to be provided to them and cite the tools used to facilitate/automate the information gathering process.
   - 11.2.1.7, "Remote Support for OS/2" on page 817
6. Given the need to interface with IBM using Remote Client Support, describe what is required to use this product.
   - 11.2.1.7, "Remote Support for OS/2" on page 817

G.3.3 Section 3: Performance

1. Describe the steps required to configure OS/2 Warp 4 in the following areas: disk performance, memory usage, network performance, DOS and Windows performance, and Desktop performance, and use a benchmark to verify a measurable performance improvement.
   - 2.10, "Tuning for Performance" on page 117
2. Given an OS/2 Warp 4 system that responds in a sluggish manner, describe the steps to configure the input queue to provide improved performance.
   - 3.5.1, "Customizing Global System Properties" on page 200

G.3.4 Section 4: Application Support

1. Given the requirement for native DOS under OS/2 Warp 4, describe the steps to run and configure a VMB session and to modify the VMB sessions to run the required program and access all HPFS and FAT hard drives.
   - 8.1.1, "Virtual DOS Machines" on page 733
2. Given an application not in the Application Migration Database, list the steps necessary to update it resulting in a new DATABASE.DAT.
   - Chapter 8, "How to Run DOS Applications" on page 733
3. State the conditions and restrictions for using a dedicated DOS session.
   - 2.5, "Advanced Installation" on page 44
4. Describe the steps necessary to setup and use the dedicated DOS session feature so that an appropriate DOS program can be started and ended and have control returned to OS/2 Warp 4.

- 2.5, "Advanced Installation" on page 44

5. Given a set of customer requirements for Windows application support, describe the steps to configure Win-OS/2 under OS/2 Warp 4 for application and printer support.
   - 9.2.2, "WIN-OS/2 Configuration" on page 756

G.3.5 Section 5: System Extensions

1. Identify the system requirements necessary to install the Java Developer's Toolkit on an existing OS/2 Warp 4 system.
   - 1.6.2, "Java Support" on page 11
   - On-line Documentation
2. Explain how to install the Java Developer's Toolkit on an existing OS/2 Warp 4 system.
   - 1.6.2, "Java Support" on page 11
   - On-line Documentation
3. Given a user requirement, explain how to install appropriate BonusPak application(s).
   - See sections concerning application installation throughout Chapter 12, "Additional Applications and Utilities" on page 829.
4. Given a customer requirement to install and configure OS/2 Warp 4 Systems Management, describe the features and functions. Describe and use the steps to install the client and list the necessary configuration parameters to setup the systems management client such that the client works correctly.
   - 5.1.2, "Easy Installation" on page 264
   - 5.7.1, "Installing Systems Management Components" on page 425
   - 5.7.2.1, "Configuring SNMP" on page 426
5. Given an environment where security functions are needed, describe the steps to enable and configure the security features provided by OS/2 Warp 4 components.
   - 2.5, "Advanced Installation" on page 44
   - 5.9.5.1, "Security" on page 489
   - On-line Help

G.4 Objectives for Test 203, "OS/2 Warp 4 Update for OS/2 Engineers"

G.4.1 Section 1: Planning and Installation

1. Given a set of requirements to configure a sound card for OS/2 Warp 4, describe the procedure and resources used to successfully configure a sound card to ensure it produces sound.
   - 2.6.2, "Installing and Configuring Audio Cards" on page 58
2. Given an existing configuration and a set of requirements, explain the steps required to install OS/2 Warp 4 with or without retaining the existing configuration, and explain the advantages and disadvantages of keeping or deleting the existing configuration.
   - 2.2.2.1, "Planning Your Migration from DOS/Windows 3.x" on page 25
3. Given a set of requirements, determine the optimal installation method and describe the steps used to install OS/2 Warp 4 using the chosen install method.
   - 2.1.1, "Memory and Disk Space Requirements" on page 15
   - 2.10.1, "General Setup Considerations" on page 118
   - Appendix A, "OS/2 Warp 4 Hardware Requirements" on page 963

G.4.2 Section 2: Speech and Multimedia

1. Describe how to move the Voice Type Dictation environment for a user to another system so that the user obtains the same level of accuracy experienced in the existing Voice Type Dictation environment.
   - 7.6.2.3, "How to Move Your Enrollment to Another System" on page 722
   - 7.11, "Trouble Shooting Your Speech Environment" on page 732
2. Describe the settings in Voice Type Dictation that can affect speech recognition accuracy.
   - 7.6.2, "VoiceType Enrollment" on page 715
3. List the steps required to enable an object to be accessed using the "jump-to" voice command.
   - 7.10, "Customizing Speech for Your Desktop" on page 729
4. Given an OS/2 Warp 4 system with speech enabled, describe how to customize the voice commands for an application.
   - 7.10, "Customizing Speech for Your Desktop" on page 729
   - 7.10.1, "The Battery-Indicator Example" on page 730
5. Describe in sequence the tasks required to install audio adapter support. This includes audio and modem support.
   - 2.8.1, "Installing and Configuring Mwave" on page 65

G.4.3 Section 3: Problem Determination and Support Services

1. Explain how to activate the Recovery Choices Menu and the circumstances in which it would be used. Given a set of circumstances, describe which choice would be selected and what the results would be.

   - Chapter 10, "Recovery" on page 773
   - 10.2.2, "System Recovery Options" on page 778
   - 10.2.2.1, "Booting to a Command Line - F2" on page 779

2. Given the need to contact IBM Support Services, list the specific information which will need to be provided to them and cite the tools used to facilitate/automate the information gathering process.

   - 11.2.1.7, "Remote Support for OS/2" on page 817

3. List the steps and software components needed to create an automated system for installing OS/2 Warp 4 using the CID process.

   - 2.9, "Configuration, Installation, and Distribution (CID)" on page 74

G.4.4 Section 4: System Extension

1. Identify the system requirements necessary and explain how to install the Java Developer's Toolkit on an existing OS/2 Warp 4 system.

   - 1.6.2, "Java Support" on page 11
   - On-line documentation

2. Given a customer requirement to install and configure OS/2 Warp 4 Systems Management, describe the features and functions. Describe and use the steps to install the client, and list the necessary configuration parameters to setup the systems management client such that the client works correctly.

   - 5.1.2, "Easy Installation" on page 264
   - 5.7.1, "Installing Systems Management Components" on page 425
   - 5.7.2.1, "Configuring SNMP" on page 426

3. Given an environment where security functions are needed, describe the steps to enable and configure the security features provided by OS/2 Warp 4 components.

   - 2.5, "Advanced Installation" on page 44
   - 5.9.5.1, "Security" on page 489
   - Online Help

G.4.5 Section 5: TCP/IP - Internet

1. List the steps to configure the Warp Client to use DHCP, and explain how to perform a successful configuration.

   - 5.1.2, "Easy Installation" on page 264
   - 5.1.3, "Advanced Installation" on page 283

2. Explain how INETD and TCP/IP Daemon configuration parameters can affect the use of system resources.

- 5.10.9, "The INETD Super Server Daemon" on page 579
- 5.10.7, "The TCP/IP Configuration Notebook" on page 557

3. List and describe the steps necessary to create, configure, and test an FTP host session using the OS/2 Warp 4 FTP host folder so that seamless access to an FTP host is achieved.
   - 5.10.13, "Setting Up an FTP Server" on page 603
4. Given a specific TCP/IP environment, describe the required configuration fields, calculate their values, and list the required steps to enable communications.
   - 5.10.7, "The TCP/IP Configuration Notebook" on page 557
5. Identify and list the steps to configure TCP/IP Services to meet customer requirements using the TCP/IP configuration tool. (FTP, TELNET, LPD, INETD).
   - 5.1.2, "Easy Installation" on page 264

G.4.6 Section 6: Networking Operating System Connectivity

1. Given the requirement to configure access to a Network Operating System (NOS), describe the criteria to select the required network support and describe the steps to configure the selected support. Describe the steps to test for successful network access to the NOS.
   - 5.3, "Accessing IBM Warp Server and Microsoft Windows NT Server" on page 342
   - 5.4, "Accessing Novell NetWare Servers" on page 355
2. List the steps to create and configure a network printer object for both File and Print services in LAN Server and non-LAN Server queues, and verify that it functions correctly.
   - 4.3, "Printer Drivers and Objects" on page 235
   - 5.2.2, "Network Printers" on page 310
   - Online Help
3. Given a set of communications specifications, configure the OS/2 Warp 4 transport for proper operation.
   - 5.8.1.5, " Configuring LAPS" on page 448

G.4.7 Section 7: Remote Access and Host Connectivity

1. Describe the configuration parameters for the Remote Access Client so that you can connect and logon to a remote access system.
   - 5.9.5, "Configuring User IDs and Security" on page 487
   - 5.9.6, "Further Configuration through the Settings Notebook" on page 507
2. Describe the steps required to install and configure the Remote Access Client so that a connection can be made successfully to a Remote Access Connection Server.

- 5.9.4, "Installing the Remote Access Client" on page 487

3. Explain how the security features of the Remote Access Client affect the user's access and usage options.
   - 5.9.5, "Configuring User IDs and Security" on page 487
4. Explain how to configure OS/2 Warp 4 for single logon and password changes to a variety of systems.
   - 5.2.10, "Coordinating Passwords on Different Servers" on page 329
   - 5.2.10.2, "Configuring Network SignON Coordinator for LAN-Based Systems" on page 330
   - 5.2.10.3, "Configuring Network SignON Coordinator for Host-Based Systems" on page 334
5. Given a customer requirement to install and configure the OS/2 Warp 4 Lotus Notes Mail Client, describe the steps to install the client, list the necessary configuration parameters to setup the Lotus Notes Mail Client, and then verify that the client works correctly.
   - 1.5.1, "Lotus Notes Mail" on page 7
   - On-line Help

Appendix H. Special Notices

This publication is intended for computer professionals who are seeking OS/2 Warp 4 certification. The information in this publication is not intended as the specification of any programming interfaces that are provided by OS/2 Warp 4. See the PUBLICATIONS section of the IBM Programming Announcement for OS/2 Warp 4 for more information about what publications are considered to be product documentation.

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Network File System	Sun Microsystems, Incorporated
NDIS	3Com Corporation and Microsoft Corporation
NFS	Sun Microsystems Incorporated
Netscape	Netscape Communications Corporation
Novell	Novell, Incorporated
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Truevision	American Telephone and Telegraph Company
Toshiba	Toshiba Corporation
Tivoli	Tivoli Systems Inc., an IBM Company
Times	Linotype AG
VDM	Geographics Systems, Limited
VESA	Video Electronics Standards Association
VL-Bus	Video Electronics Standards Association
Video Blaster	Creative Technology Limited
VINES	Banyan Systems, Incorporated
VT	Digital Equipment Corporation
VT100	Digital Equipment Corporation
VT52	Digital Equipment Corporation
WEB	WEBCORP
WordPerfect	WordPerfect Corporation
Win32s	Microsoft Corporation
WinTV	Hauppauge Computer Works, Incorporated
Windows 95	logo Microsoft Corporation
X Window System	Massachusetts Institute of Technology

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Glossary

access control profile. Information maintained by OS/2 Warp 4, listing the network users that may access a **network resource**, and the type of access permitted for each user.

acoustic model. Models acoustic behavior of words by gluing together models of smaller units, such as phonemes.

additional server. **Server** within a **domain**, which shares its resources but does not maintain a record of users, resources or access control profiles. The additional server authenticates users and authorizes access using the **domain controller**.

address space. Area of memory accessible by a particular application running under OS/2 Warp 4. All memory is managed by the operating system, which allocates memory to a specific application in response to access requests made by that application.

alias. Name by which a network resource is known on the network.

archive. Backup copy of your OS/2 Warp 4 desktop and system configuration files, created by the OS/2 Warp 4 **Desktop Archive** feature. You can use an archive to restore your system to a previous configuration if you lose your current configuration files or desktop setup.

AVI. Audio/Video Interleaved; format used for the storage of video footage with associated sound tracks, in files on a computer. AVI data files are normally compressed for storage and then decompressed for playback, using a **CODEC**.

bindery emulation. Technique that allows a Novell NetWare 4.x server to emulate the login, authentication and resource mapping processes used by Novell NetWare 2.x and 3.x servers.

BIOS. Basic Input-Output System; software that controls the interface between your computer's hardware and the operating system. Typically stored in **ROM**.

boot drive. **Logical drive** on which you install OS/2 Warp 4 By default, this is drive C:, but you can install OS/2 Warp 4 on any logical drive if you wish.

boot manager. Feature of OS/2 Warp 4, configured at installation time, that allows multiple operating systems to be installed on the same computer, using different **logical drives**, and allows the user to choose between them at startup time.

bridge. See **Router**.

callback security. Security technique for dial-up communications, whereby the computer that is called breaks the connection and then calls the computer that requested the connection, either at a telephone number specified by the calling computer, or using a number obtained from a list of authorized telephone numbers. This technique is implemented by the remote access component of OS/2 Warp 4.

clipboard. Architected mechanism for passing data between applications. You can take data from an application by either "cutting" or copying it to the clipboard, then "paste" it into another application.

CODEC. compression/decompression algorithm; method used to compress video footage for storage in computer files, and then decompress it for playback.

connection profile. Information maintained by OS/2 Warp 4, defining how your computer will connect to and access a **network resource**.

connection server. Computer on a **local area network**, running the Connection Server component of OS/2 Warp Server, enabling a

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remote client to dial in and use the connection server as a bridge for connection to the local area network.

DDE. See **Dynamic Data Exchange**.

DDNS. See **Dynamic Domain Name Services**.

default login drive. **Network resource** on a Novell NetWare server, containing files such as **login scripts**, enabling you to login and access the resources of that server.

desktop archive. Feature of OS/2 Warp 4 that allows you to create backup copies of your OS/2 Warp 4 desktop and system configuration files. You can then use these backup copies to restore your system to a previous configuration if you lose your current configuration files or desktop setup.

DHCP. See **Dynamic Host Configuration Protocol**.

directory tree. Collection of **servers** and **network resources** under Novell NetWare 4.x, which are treated as a group for the purposes of user authentication.

DIVE. Direct Interface Video Extensions; programming interface that allows applications to manipulate video memory for high-performance graphical tasks.

domain. Collection of network resources, such as shared drives, directories and printers, which may reside on one or more **servers** in a network, and be accessed by **requesters**. The resources that comprise a domain are controlled and managed as a single group.

domain controller. **Server** within a **domain**, which maintains a record of the users, network resources and access control profiles for the entire domain.

domain names. Naming convention used to identify computers on a **TCP/IP** network or the **Internet**. Requires a domain name server to resolve **IP addresses** into alphanumeric names.

domain name server. Computer on a **TCP/IP** network or the **Internet**, that maintains lists of **IP addresses** and **domain names**, and resolves names into IP addresses on behalf of other computers on the network.

dotted decimal notation. System of identifying computers on a TCP/IP network or the Internet, whereby each computer is given an address of the form *xxx.xxx.xxx* where *xxx* is a decimal number in the range 0-255. These addresses are typically known as **IP addresses**.

DPMI. DOS Protect Mode Interface; standard for allowing DOS applications to access memory above 640KB. Commonly used by Windows applications. See also **EMS** and **XMS**.

dual boot feature. Feature of OS/2 Warp 4, configured at installation time, that allows a computer to have OS/2 Warp 4 and DOS/Windows installed on the same drive, and to switch between the two at reboot time.

dynamic data exchange. Architected mechanism for memory sharing, whereby applications can communicate with one another to pass data back and forth. For example, you may link a spreadsheet program to a graphing program via DDE; whenever you update the spreadsheet, the graph is automatically updated too.

dynamic domain name services. **TCP/IP** feature implemented in OS/2 Warp 4, which simplifies network access, operation and change by dynamically resolving **host names** into **IP addresses** at the time a request is made.

dynamic host configuration protocol. **TCP/IP** feature implemented in OS/2 Warp 4, which eases network administration by dynamically allocating and reallocating **IP addresses** as computers connect to and disconnect from the network.

EMS. Expanded Memory Specification; standard for allowing DOS applications to access memory above 640KB. Developed by

Lotus, Intel and Microsoft See also **DPMI** and **XMS**.

Ethernet. Type of local area network whereby traffic is passed on the network using a method known as Carrier Sense/Multiple Access with Collision Detect (CSMA/CD). This method is less efficient than a **Token-Ring** network of equivalent speed, but cabling and network adapters are often less costly.

extended partition. Type of hard disk partition supported by OS/2 Warp 4 An extended partition can contain OS/2 Warp 4 code, applications and data files, and is accessible from any operating system selected using **Boot Manager**. See also **Primary Partition**.

FTP. File Transfer Protcol; protocol used on **TCP/IP** networks and the **Internet** for file transfer.

FLC/FLI. File format for storing compressed video animation sequences. Developed by Autodesk Inc.

GIF. Graphics Interchange Format; file format for storing graphical images, such as photographs. Developed by Compuserve Information Services.

host. Computer on a **TCP/IP** network or the **Internet**.

host name. Name used to identify a host on a TCP/IP network or the Internet, using the **domain names** convention. Host names are typically more meaningful than **IP addresses**, and therefore easier to remember.

HTML. **HyperText Markup Language**; language used to specify the content and format of pages on the **Worldwide Web**.

installation server. Computer running OS/2 Warp 4, which uses the OS/2 Warp 4 **Remote Install** utility to perform remote installation to another computer over a **LAN**.

installation target. Computer on which a remote installation is performed using the OS/2 Warp 4 **Remote Install** utility. See also **Installation Server**.

Internet. Largest computer network in the world, consisting of over 50,000 different computers belonging to government, educational and commercial organizations, and to private individuals. Accessible from a computer running OS/2 Warp 4.

Internet Service Provider. Organization that provides a service allowing you to connect to the Internet. Most Internet service providers provide **SLIP** and **PPP** connections allowing you to dial their server using a **modem** and a standard telephone connection.

IP address. System of identifying computers on a TCP/IP network or the Internet, whereby each computer is given an address of the form *xxx.xxx.xxx* where *xxx* is a decimal number in the range 0-255. See also **dotted decimal notation**.

IPX. Internetwork Packet Exchange; network protocol used by the Novell NetWare network operating system.

JPEG. Joint Photographic Experts Group; file format used to store graphical images such as photographs. Often provides a greater level of compression, and therefore a smaller file, than an equivalent **GIF** image.

LAN. See **Local Area Network**.

LM10. Term used to describe a **NETBIOS** interface that conforms to the Microsoft LAN Manager V1.0 specification.

local area network. Network of computers, typically within a single geographical location. Computers on a LAN may communicate with one another to share resources, send electronic mail or messages, etc.

logical drive. Partition on a fixed disk, accessed using a drive letter. For example, drive C: is a logical drive, as is drive D:.

login script. **(1)** File residing in the **default login drive** on a Novell NetWare server, containing information on the default network

connections that will be established when you login to that server. **(2)** File that contains questions and answers required for logging in to an **Internet Service Provider** and connecting to the **Internet**.

MAC. See **Media Access Control**.

mapping. Process of assigning a **logical drive letter** or port name to a **network resource**, so that it can be accessed in the same way as a drive or device directly attached to your computer.

media access control. Term used to describe the interface between a device driver and the device that it controls. Typically used when discussing network adapters and device drivers. Lowest software layer of the ISO networking interface model.

memory extenders. Software products that interface to memory hardware and allow DOS or Windows applications to access memory above 640KB. The three most common extender standards are **DPMI**, **EMS** and **XMS**. OS/2 Warp 4 supports all three of these standards for use by DOS or Windows applications running under OS/2 Warp 4. Windows includes built-in memory extender support, while commercial products are available that provide this support for DOS systems.

MIME. Multi-purpose Internet Mail Extensions; protocol allowing multiple types of data to be combined in a single electronic mail item and sent over a **TCP/IP** network or the **Internet**.

modem. Modulator/Demodulator; device that allows your computer to communicate with another computer over a telephone line.

multiprocessing. The ability for a computer to use multiple processors simultaneously, thereby improving performance. Multiprocessing is normally controlled by the hardware itself, but requires software such as an operating system to support the use of multiple processors. See also **multitasking**.

multitasking. The ability for a computer to run multiple programs concurrently, using a single processor, by sharing processor time between programs. Multitasking is normally controlled by software rather than hardware. See also **multiprocessing**.

name context. Fully-qualified path within a Novell NetWare 4.x **directory tree**, which identifies the **server** on which your user ID is defined.

name server. See **Domain Name Server**.

NDIS. Network Driver Interface Specification; standard devised by 3COM and Microsoft for communication between networking applications and network adapter drivers. See also **ODI**.

NDS. See **NetWare Directory Services**.

NETBIOS. Network protocol for communicating on a LAN. Used by network applications such as OS/2 Warp 4's **peer services** and requester service components, as well as Microsoft Windows for Workgroups and Windows NT Server.

NetWare directory services. Component of Novell NetWare 4.x, which allows users to access resources on more than one server at the same time. Servers are grouped into **directory trees**, each of which is similar in concept to a **domain**.

network adapter. Adapter card that fits into your computer, and allows you to connect to a **local area network**.

network adapter driver. Software component that allows networking applications to communicate using a particular **network adapter**. Drivers are typically unique to a particular network adapter or family of adapters. See also **NDIS**.

network drive. **Logical drive** that resides on another computer, to which you connect over a **local area network** using one of the networking components of OS/2 Warp 4.

network resource. A disk, directory, printer or comms port that can be shared with other users on a **local area network**.

ODI. Open Data-link Interface; standard devised by Apple and Novell for communication between networking applications and network adapter drivers. See also **NDIS**.

peer services. Networking component of OS/2 Warp 4 that allows a computer to share its resources (such as drives, directories and printers) on the network, for access by other computers running OS/2 Warp 4, Microsoft Windows for Workgroups or Microsoft Windows NT Workstation. A computer running OS/2 Warp 4 with peer services installed can also access resources on computers running any of these operating systems.

POP. Post Office Protocol; protocol used on **TCP/IP** networks and the **Internet** for retrieving electronic mail from a mail server.

PPP. Point-to-Point Protocol; network protocol that allows computers to communicate using the **TCP/IP** protocol over a standard telephone line. See also SLIP.

primary partition. Type of hard disk partition supported by OS/2 Warp 4. A primary partition can contain operating system code for any operating system, as well as applications and data. Primary partitions are selectable using **Boot Manager**, and only one primary partition can be visible to an operating system at any one time. See also **Extended Partition**.

product information file. File containing modem and connection information, used by the remote access component of OS/2 Warp 4 to initialize a modem.

RAM. random access memory; memory used to store programs and data for immediate processing in your computer. RAM is volatile; that is, it loses its contents when your computer is turned off. See also **ROM**.

remote client. Term used in the remote access component of OS/2 Warp 4, to denote a computer dialling into a **local area network** using remote access

remote host. Computer on a **TCP/IP** network or the **Internet**, to which you connect using the **FTP** protocol, in order to transfer files.

remote install. Technique that allows you to install OS/2 Warp 4 on a computer and then use that computer and its CD-ROM drive to install OS/2 Warp 4 on other computers over a **LAN**., using OS/2 Warp 4's **Remote Install** utility.

requester. Computer running a software package, such as OS/2 Warp 4, that allows the computer to connect to a **server** and access its resources.

RIP. See **Routing Information Protocol**.

ROM. Read-Only Memory; non-volatile memory used to store important information such as hardware/software interface procedures. Processing information stored in ROM is typically slower than processing the same information stored in **RAM**, but ROM does not lose its contents when your computer is turned off. See also **RAM**.

ROM BIOS shadowing. Technique whereby **BIOS** code stored in **ROM** is copied into **RAM** when the computer is turned on, in order to improve BIOS performance. This technique may affect the amount of memory available to OS/2 Warp 4 and your applications.

rot13. Technique used to "scramble" information on Internet newsgroups by moving each character 13 positions in the ASCII character set. You can unscramble such news items using the **unrot13** option from the **File** pulldown menu within **NewsReader/2**.

router. Computer or other device that allows two TCP/IP networks to communicate with one another, either directly using the router as a gateway, or through a telephone connection. Also used to connect other types of network,

but the term **bridge** is more commonly used in such cases.

Routing Information Protocol. Protocol used on **TCP/IP** networks to maintain and control routes to different networks and hosts. See also **router**.

Server. Computer running one or more types of network server software, such as IBM OS/2 Warp Server, Novell NetWare or Microsoft Windows NT Server. Server computers share their resources with other servers and/or **requesters** on the network, with appropriate measures for security and access control.

shuttle feature. Feature of the remote access component of OS/2 Warp 4, enabling you to switch back and forth between a "virtual" LAN connection (using remote access) and a "real" LAN connection (using a network adapter).

SLIP. Serial Line Interface Protocol; network protocol that allows computers to communicate using the **TCP/IP** protocol over a standard telephone line. See also **PPP**.

SMTP. Simple Mail Transfer Protocol; network protocol used on **TCP/IP** networks and the **Internet** for electronic mail delivery.

SNMP. Simple Network Management Protocol; network protocol used on **TCP/IP** networks for managing the network and devices attached to the network.

subnet. Technique used to separate the network and **host** portions of an **IP address** when using **dotted decimal notation**.

subnet mask. Number used to extract the **host** portion of an **IP address**. Expressed using **dotted decimal notation**.

TCP/IP. Transmission Control Protocol/Internet Protocol; family of network protocols, typically used in wide area networking environments, and on the **Internet**.

Token-Ring. Type of **local area network**, whereby traffic is passed on the network using a method known as token-passing. Token-Ring networks typically allow higher data traffic than an **Ethernet** network of equivalent speed, due to greater efficiencies in the network protocol, but are often more costly.

UART. Universal Asynchronous Receiver/Transmitter; chip inside your computer that controls serial communications.

URL. Uniform Resource Locator; addressing technique used for **Internet** sites, comprising the site's domain name prefixed by the access method used to address it. For example *http://www.ibm.net*

utility diskettes. Set of three diskettes that enable you to boot OS/2 Warp 4 to a command line prompt and perform problem determination and error correction tasks.

VDM. See **virtual DOS machine**.

virtual 8086 mode. Execution mode of the Intel processor family, first introduced in the 80386 processor, whereby the processor emulates multiple 8086 processors, each with its own registers. Also known as V86 mode.

virtual device driver. Device driver accessed by a DOS or Windows application under OS/2 Warp 4 to communicate with a hardware device. The virtual device driver does not actually communicate directly with the hardware; instead it communicates with the OS/2 Warp 4 physical device driver for that device. In this way, each DOS or Windows application "thinks" it controls the hardware directly, while OS/2 Warp 4 allows multiple applications to communicate with the hardware through its own multitasking device driver interface.

virtual DOS machine. Execution environment for a DOS or Windows application under OS/2 Warp 4. A VDM uses the **virtual 8086 mode** of the Intel processor family to provide an emulated DOS environment in which a DOS or Windows application "thinks" it is running in a native DOS or Windows system.

Win32s. Application programming interface used by many applications that run under both Microsoft Windows 3.1 and Windows 95.

WIN-OS/2. Feature of OS/2 Warp 4 that allows you to run Windows applications on a computer under OS/2 Warp 4.

Worldwide Web. Collection of servers on the **Internet** that allow access to textual, graphical and other information, displayed in pages using the **HyperText Markup Language**. OS/2 Warp 4 supports such access through its **WebExplorer** utility.

XMS. Extended Memory Specification; standard for allowing DOS applications to access memory above 640KB. See also **DPMI** and **EMS**.

List of Abbreviations

APA	all points addressable
API	application programming interface
APM	advanced power management
APPC	advanced program-to-program communication
APPN	advanced peer-to-peer networking (IBM program product)
ATM	Adobe Type Manager
BBS	bulletin board services
BMP	Bitmap
CDROM	compact disk read only memory
CID	configuration, installation and distribution
CTS	common transport semantics
DCDB	domain control database
DDE	dynamic data exchange
DDNS	Dynamic Domain Name Server
DHCP	Dynamic Host Configuration Protocol
DIB	RIFF DIB Image
DMI	desktop management interface
DPI	distributed protocol interface
DPMI	DOS protect mode interface
EMS	expanded memory specification
FAT	file allocation table
FDISK	fixed disk utility program
FTP	file transfer program
HIF	host information file
HPFS	high performance file system
HTML	hyper text markup language
IBM	International Business Machines Corporation
IEEE	Institute of Electrical and Electronics Engineers
IPX	INTERNET packet exchange
ISDN	integrated-services digital network
ISO	International Organization for Standardization
ITSO	International Technical Support Organization
IP	Internet protocol (ISO), internetwork protocol (OSI)
IPX	internetwork packet exchange

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IRQ	interrupt request
ISA	industry system architecture
JPEG	joint photographic experts group
LAN	local area network
LAPS	LAN adapter and protocol support
MAC	media access control
MIME	Multi-purpose Internet Mail
MIB	management information base
MPTS	multi-protocol transport services
MPTN	multi-protocol transport network
MVS	multiple virtual storage
NDIS	network driver interface specification
NRZ	non-return-to-zero
NRZI	non-return-to-zero inverted
NSC	networg sign-on coordinator
ODI	open data-link interface
PCMCIA	Personal Computer Memory Card International Association
PCI	peripheral component interconnect
PPP	Post Office Protocol
PPP	point-to-point protocol
PROFS	Professional Office System
PSTN	public switched telephone network
PIF	product information file
RACF	resource access control facility
RIP	routing information protocol
SLIP	serial line Internet protocol
SMTP	simple mail transfer protocol
SNMP	simple network management protocol
SPX	Sequenced Packet eXchange
TCPIP	transmission control protocol internet protocol
TGA	Truevision Targa
TIF	Tag Image File Format
UART	Universal Asynchronous
URL	Uniform Resource Locator
VDD	virtual device driver
VDM	virtual DOS machine
VESA	Video Electronics Standards Association
VM	virtual machine
WAN	wide area network
XMS	extended memory

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